Nicolet Vascular

Pioneer TC8080 and Companion III

User Manual

December, 2004

Manufactured by:
SciMed Ltd. UK

CE 0088

Nicolet VASCULAR
a division of VIASYS Healthcare

Nicolet Part Number M7-W001 Rev G

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Function And Intended Application

The Pioneer TC8080 system and the Companion III system are advanced Transcranial Doppler (TCD) ultrasound systems which run the WinTCD software package allowing non-invasive assessment of blood flow velocities throughout the body. This method of measurement is particularly useful for examining the major arteries supplying blood to the brain.

TCD is useful for evaluation of numerous neurologic vascular problems such as vasospasm and intracranial stenosis. TCD is also extremely valuable for intraoperative monitoring to help detect sudden changes in flow and potential embolic events. Emboli are small particles of foreign matter (air, particulate, thrombin, etc.) within the bloodstream that can potentially cause obstructions in various arteries in the body and the brain. Such obstructions can often lead to stroke.

The following non-invasive methodologies are included:

- Diagnostic cerebrovascular and extracranial investigation.
- Extended-term unilateral, bilateral, and multilateral cerebrovascular monitoring.
- Microvascular studies.

The systems can be used for the following applications:

- Intracranial stenosis.
- Detection of vasospasm due to subarachnoid hemorrhage.
- Detection of arteriovenous malformations (AVMs).
- Assessment of collateral pathways.
- Document important sudden changes in flow velocities.
- Track and establish trends of flow velocities during drug administration in the operating room.
- Help improve surgical techniques through immediate feedback of the results of interventional procedures, including the study and documentation of possible microemboli which may result in stroke.
- Demonstrate the resulting effects of new or experimental drugs on intracranial blood flow velocities.
- Document the informative results of CO2 reactivity testing.
- Evaluate flow velocity profiles inside vessels during neuro or vascular surgery by placing microvascular transducers directly on vessels.

System Comparison

The Pioneer TC8080 system and the Companion III system are essentially identical in their intended applications. The main difference between the systems is that the Pioneer TC8080 system is intended as a desktop or cart based system and the Companion III system is designed as a portable system.

The Pioneer TC8080 system is the top of the line product including a few extra capabilities and more room for expansion.

The Companion III system provides the portability but is subsequently limited in capabilities and future expansion.

The following sections describe the individual system features providing information on the system specific features.

Companion III System Design

The Nicolet/EME Companion III is a completely self-contained, truly portable Transcranial (TCD), extracranial and peripheral vascular Doppler system that quickly goes where your practice needs it: Office, Clinic, Hospital, or Home.

System Specific Features:

- Portable system with integrated TFT Display - for mobile applications.
- Touchscreen display for faster, simpler on-the-spot operation.
- Two integrated transducer sockets allowing up to two probes to be used simultaneously.
- Integrated medical grade power supply to allow portable examinations to save the data without the need for an additional isolation transformer.

Pioneer TC8080 System Design

The Nicolet/EME Pioneer TC8080 is the flagship Transcranial (TCD), extracranial and peripheral vascular Doppler system that is intended for the non-portable vascular lab or clinical environment looking for high end performance.

System Specific Features:

- Desktop system with external high resolution monitor or TFT Display.
- Optional laboratory cart.
- Four integrated transducer sockets allowing up to four probes to be used simultaneously.
- Dual frequency capability.
- Integrated isolation transformer to allow the display and printer to be powered without the need for an additional isolation transformer.
- Advanced processor.
- Extra PCI slots for future expansion.

Features and Benefits

Features	Benefits
Renowned EME high sensitivity 1.6 and 2 MHz pulsed wave Doppler probes.	• Locate signals in the toughest patients and deepest areas.
Combined pulsed and continuous wave Doppler in the 4 and 8 MHz probes.	• For increased utility throughout the body.
Microvascular 16 MHz and 20 MHz option.	• Allows intraoperative microvascular flow evaluation. Autoclavable 1.5mm and 2.0mm transducers are available.
MDD-Mode.	• Allows more data to be interpreted in a simple fashion. Can aid as a window finder to locate signal on difficult to insonate patients. Can aid in the identification of embolic events. View a greater number of vessel segments for a wider field of view. All Doppler signals from all channels are always available for review and analysis.
Unique SoundTrak™ software option.	• Saves what you hear. Exact digital sound reproduction, critical in evaluating suspected embolic events, for all active channels simultaneously even in MDD-Mode operation. Now also available with the Continuous SoundTrak option enabling the recording of complete examinations eliminating the need for an external DAT recorder.
Advanced monitoring and trending program option.	• For complete records, and sophisticated research protocols. Extremely flexible with analog input & output capabilities.
Advanced H.I.T.S. Indicator.	• For more precise automated indicator of embolic signals. Clinically demonstrated to be on par with the human observer.
Multi-depth capabilities.	• Advanced multi-segment vessel interrogation, improved emboli indication.
Easy to use, comprehensive remote control.	• All control functions are at the user's fingertips.
Wireless remote control option.	• Improved convenience and fewer cords to tangle.
User programmable function keys on the remote control and footswitch.	• For convenience and flexibility. Suited to individual users.

Features and Benefits (continued)

Features	Benefits
NicVue Patient administration and scheduling software.	• Allows for complete patient management from appointment scheduling to data archiving in an efficient, flexible package.
One-touch text and graphics reports.	• Allows fast review, interpretation and documentation.
On-line signal post processing for improved data presentation.	• Quick on-the-fly adjustment for optimum signal recording.
Powerful PC Base.	• Simple upgrades, and Windows 2000 / Windows XP compatibility.
Extensive user configuration options.	• Set the system up to meet your preferences.

Intended operator

The Pioneer TC8080 system and the Companion III system are intended for trained and skilled personnel in collecting transcranial data and peripheral Doppler ultrasound from a test subject.

Structure of Manual

This manual is divided up into two main parts:

The first part consisting of the chapters with page numbers beginning with **H** covers the hardware related issues for the Pioneer TC8080 and Companion III systems.

The second part consisting of the chapters with page numbers beginning with **S** covers the functionality of the WinTCD software package which is used on both systems.

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This chapter provides information concerning the safety of the Pioneer TC8080 and Companion III systems.

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This chapter provides information concerning the safety of the Pioneer TC8080 and Companion III systems.

Information in this chapter is subject to change without notice.

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Regulatory Compliance

SciMed Ltd. is an ISO 9001: 2000 and ISO 13485: 1996 and CMDCAS approved manufacturer of medical equipment.

The **Pioneer TC8080** and **Companion III** systems have been certified and tested by Intertek Testing Services, ETL SEMKO, to comply with the General Requirements for Safety UL2601-1: 1997, CAN/CSA-C22.2 No. 601.1-M90 (ETL listed and labeled), EN60601-1: 1990 + A1: 93, A11: 93, A12: 93, A2: 95, A13: 96, Corrigendum: 94 and IEC 601-1: 1998 + A1: 91, A2: 95, Corrigendum 95.

The **Pioneer TC8080** and **Companion III** systems have been certified and tested by TRL Compliance Services Ltd. to comply with the Medical Collateral Standard for Electromagnetic Compatibility IEC 60601-1-2: 2001 and IEC 60601-1-2-AM1: 2004.

The **Pioneer TC8080** and **Companion III** systems have been certified and tested by Intertek Testing Services, ETL SEMKO, to comply with the Collateral Standard: Safety requirements for medical electrical systems EN 60601-1-1: 2001 and IEC 60601-1-1: 2000.

The **Pioneer TC8080** and **Companion III** systems are class IIa products that have been CE approved to the Medical Devices Directive 93/42/EEC by Lloyds Register Quality Assurance (LRQA) in the United Kingdom, Notified Body no. 0088.

The degree of protection in the system against electric shock conforms to EN60601-1 : 1990.

Precautions

IMPORTANT:
Please read this manual carefully before setting up the system or before connecting other instruments. Read and follow all WARNINGS, CAUTIONS and NOTES provided in this user manual. To avoid the possibility of personal injury, damage to your system or lost data, observe these safety precautions during system operation.

In this manual, two labels identify potentially dangerous or destructive conditions or procedures:

! WARNING

The WARNING label identifies conditions or practices that may present danger to the patient and/or user.

! CAUTION

The **CAUTION** label identifies conditions or practices that could result in damage to the equipment.

Notes: These help you identify areas of possible confusion and avoid potential problems during system operation.

WARNING

This device uses a three wire power cord with a hospital grade plug (for international applications, IEC 601-1 approved plug). The chassis is earth grounded. For grounding reliability, connect the device to a hospital grade or hospital only receptacle (for international applications, IEC 601-1 approved receptacle).

Connection of the system to any mains powered electrical accessories must be in accordance with IEC 601-1-1 : 2000. This standard describes the safety requirements for medical electrical systems to provide protection to the patient, the operator and the surroundings.

The system must be connected to a mains plug that conforms to all valid safety regulations.

Do not use extension cords for the system. Extension cords can cause ground integrity and impedance problems.

On the Pioneer TC8080 system, when an external monitor, printer, or any other electronic piece of equipment is connected to the system, it must be powered through the main system's power sockets.

WARNING

On the Pioneer TC8080 system, there are separate voltage selectors for the input voltage and the isolated output voltage. Particular care must be taken when selecting voltages and this should only be carried out with the mains input cord removed. It is possible to have 230V output with 115V selected on the input or 115V output with 230V selected on the input. Both voltage selectors should be set to the same value. The output frequency will always be the same as the input frequency.

On the Companion III system, when an external monitor, printer, or any other electronic piece of equipment is connected to the system, it must be powered via the Portable Isobox. If not, leakage limits may be exceeded. The Nicolet Portable Isobox may be obtained from the suppliers listed in chapter H5.

Before use, both the system and any accessories should be checked for possible damage. The mains cables should be carefully examined. If the insulation or plug is damaged, an authorized person should replace it immediately. Damaged probes should not be used under any circumstances.

WARNING

Improper earthing of the system can result in an electric shock.

The system must be earthed.

The infrared port on the hand controller is classified as a class 1 LED (Light Emitting Diode) device according to International Standard IEC 825-1 (EN60825-1). This device is not considered harmful, but the following precautions are recommended: 1. Avoid direct eye exposure to the infrared LED beam. Be aware that the beam is invisible light and cannot be seen. 2. Do not attempt to view the infrared LED beam with any type of optical device.

On both systems, when a DAT recorder is used to record or playback Doppler audio data, it must be powered through the main system's isolated power sockets (Pioneer only), or via the portable Isobox (Isolation Transformer).

WARNING

The DAT recorder must meet the standard relevant to your country: IEC 60065:2001, BS EN 60065:2002, UL 60065:2003, CAN/CSA-C.22.2 No 60065-03, IEC 60950-1:2002, BSEN 60950:2002, UL 60950-1:2002, CAN/CSA-C.22.2 No 60950-1-03.

Where applicable, a potential equalization connection point is provided on the system or chassis of the device for connection to the corresponding parts of other devices connected to the patient. Such connections may be used to help reduce the incidence of ground and/or leakage currents which can occur through patient connections of devices with separate grounding systems.

When more than one medical device is connected to the patient, leakage currents of the devices are summed together. Use caution.

Whilst using the system for an examination, do not touch the interconnecting cable connectors on the rear panel of the system, or the non-medical equipment and the patient simultaneously.

WARNING

Whilst using the system for an examination, it is recommended that no electrical connections be made to the system other than those specified in chapters H3 and H4. If this is unavoidable ensure that the extra connections conform to IEC 601-1-1 : 2000.

To minimize risk of injury to patient and/or operator, use only EME/Nicolet approved accessories with the system that are specified in this manual.

All nonmedical equipment connected to this device, such as printers, must comply with IEC 950 and/or appropriate European Directives.

To guard against possible injury or damage to the system during installation, make sure the system power switch is in the OFF position until otherwise instructed.

Do not switch on any system power until all cables have been properly connected and verified.

WARNING

The casing of the system is, under no circumstance, to be removed by any unauthorized persons, as there are live components within the system.

Customer service and maintenance must be carried out exclusively by the manufacturers. See chapter H5 for more information.

No system repairs or maintenance may be carried out while an examination is taking place.

When replacing mains fuses, make sure that only the specified fuses are used (IEC 127 Sheet III). Refer to the Technical Specification in Chapter H6 for the correct rating.

The system is not designed for use in areas with high relative humidity. Because of the restricted protection against drops and splashes of water, the system should not be set up where this is likely to occur e.g. under infusion stands etc.

WARNING

When using an Isobox isolation Transformer, ensure that the voltage selector on the Isobox is set to the correct voltage before connection.

If an Isobox isolation transformer is not available for connecting a mains powered accessory, the system may NOT be used.

The system is designed for use in medical areas only. It must not be used in areas where there is a danger of explosion such as near flammable anaesthetic gases.

This equipment is not protected against defibrillation. Remove the patient to system connection prior to defibrillation. If defibrillation is applied to the patient while connected to the system, damage may occur. Test system leakage current after defibrillation.

The system should never be placed directly on the floor.

WARNING

When using the 16 and 20 MHz microvascular probes with the system, refer to chapter H5 for important safety and cleansing/ sterilizing procedures. The 16 and 20 MHz probes are not sterile as supplied. Before using them for the first time, ensure that sterilization procedures are carried out. The 16 and 20 MHz probes must be sterilized before each subsequent use.

The microvascular pods must not be sterilized. These may be cleaned using the procedures in chapter H5.

Inspect transducer assemblies on a regular basis for possible damage (cracks which could allow the ingress of conductive fluids, cable or connector damage, etc.). Never use a damaged transducer.

To reduce risk of injury: Use proper lifting techniques when moving or lifting the system components.

Follow all safety standards set by your place of employment.

In all cases, the original data must be reviewed if a clinical decision is involved.

WARNING

Do not use ultrasound intensities greater than 10% for transorbital examinations.

None of the transducers supplied with the system are intended for fetal use or pediatric applications.

Depending on your locality, your computer's battery might be considered as hazardous waste. Follow all of your respective local laws and regulations for the proper disposal of batteries and any other parts of your system such as monitors, amplifiers, keyboards, electrodes, etc.

Federal law in the U.S.A. and Canada restricts this device to sale by or on the order of a medical practitioner licensed by the law of the state in which they practice to use or order to use this device.

This equipment is not protected against loss of mains power. The use of an UPS is recommended to avoid losing data.

CAUTION

Preventative maintenance does not require access to the interior of the instrument and may be performed by the user. For this device, preventative maintenance consists of periodically cleaning and inspecting the exterior of the instrument. Periodic electrical safety testing is recommended. It is recommended a schedule be established for these purposes, with at least an annual cleaning and safety testing. This system does not require calibration.

Turn off the system power before cleaning. Prevent detergent solution or cold sterilization agent from seeping into the electronics of the system. Be especially careful around controls, the TFT touchscreen display (Companion III), connectors and panel edges. Do not use abrasive cleansers.

On the Companion III system, wipe the TFT touchscreen display lightly with a soft lint-free cloth. If necessary, a small amount of mild detergent may be used. Do not use any type of abrasive pad, scouring powder or solvent.

CAUTION

Switch off system power before connecting or disconnecting any system component(s) or accessories. You may damage the device(s).

If you disconnect cables, please be careful to reconnect them in their proper locations.

To guard against damage to the system when using the audio inputs, make sure that the input voltages, going to the system via the analog connection box, do not exceed 10 Vpp.

If the system is not functioning properly, do not operate it until all necessary repairs are made and the unit is tested for proper functioning in accordance with Nicolet Vascular Division of VIASYS Healthcare published specifications.

Do not attempt to reinstall the system software without consulting a qualified Nicolet/EME Service Representative first. You can destroy data. Follow the steps provided only under the direction of a qualified Service Representative.

CAUTION

Follow the Shutdown sequence described in this guide to turn off the system to ensure the integrity of your data files.

Leave at least 30 seconds between turning off the system using the Power Switch, and switching it back on.

The customer is responsible for maintaining all system software (CDs and/or diskettes) in a safe, secure location.

Ultrasound Safety - Factors Influencing Ultrasound Power Output

With pulsed-wave ultrasound, a transducer sends a pulse of ultrasound into tissue and then waits for part of the pulse's energy to be reflected back. Ultrasound waves dissipate energy in the form of heat and can therefore cause tissue warming. Although this effect is extremely low with transcranial Doppler, it is important to know how to control and limit patient exposure. Major governing bodies in ultrasound have issued statements to the effect that there are no known adverse effects from the use of diagnostic ultrasound, however, exposure levels should always be limited to As Low As Reasonably Achievable (the ALARA principle).

You can control the ultrasonic power or patient exposure to ultrasound in any of the following three ways:

- Adjust the pulse strength (amplitude)
- Adjust the duration of the pulse (sample volume)
- Adjust the pulse rate (pulse repetition frequency or scale)

To change these settings for the WinTCD system, use the following:

Amplitude

The amplitude (voltage to transducer) setting directly influences the amplitude of the pulse burst. A higher setting increases the amplitude, resulting in a higher ultrasound output at the transducer.

Sample

The "Sample volume" is the axial length of the area from which the Doppler signals are obtained. The larger the sample volume, the longer the duration of the pulse burst, and consequently the higher the ultrasound output and power.

Scale

The higher the scale setting, the higher the pulse repetition frequency (number of pulses per second), and consequently higher ultrasound output. More pulses per second is equivalent to a higher power output. Ultrasound exposure (power) is measured as an average over time.

Proper use of these instrument settings can minimize patient exposure, and optimize the results and efficiency of the equipment. Always apply the ALARA principle; use power levels that are: As Low As Reasonably Achievable.

Refer to the section Display of the Thermal Index on the next page for more information on controlling the ultrasound exposure.

Note: In the Multichannel Monitoring mode, if the sum of the Ultrasound intensities goes above 100% then the Power Parameter Boxes will turn yellow to indicate this condition on systems in the United States.

Note: When the Tx/Rx Linkage function is On, the Sample key will adjust the length of both the transmit and receive pulse lengths. When the Tx/Rx Linkage function is Off, the transmit pulse length can only be adjusted by using the functions Inc. Tx Pulse Width or Dec. Tx Pulse Width. Adjustments made to the Rx Pulse Width will not change the power output. See section S7.

Display of the Thermal Index

In addition to the acoustic power output expressed as a percentage value, the system also provides a thermal index to help the operator use ALARA when the acoustic output has the potential to significantly increase the tissue temperature.

There are two types of thermal indexes used in the system:

- **Cranial Bone Thermal Index (TIC)** - This Index, which is based on a model where the bone is located close to the surface of the skin, is displayed for the 1.6 MHz and 2 MHz transcranial transducers.

- **Soft Tissue Thermal Index (TIS)** - This Index, which is based on a model where the ultrasound travels through soft tissue only, is displayed for the 4 MHz and 8 MHz extracranial transducers as well as the 16 Mhz and 20 MHz microvascular transducers.

The Thermal Indexes are displayed along with the parameter boxes provided with each spectral display window. The values are referred to as TIC and TIS.

The higher the thermal index value, the greater the tissue warming will be. Adjustments of the three parameters on the previous page will cause the thermal index numbers to change.

Thermal Index values less than 1 are displayed to help in implementing the ALARA principle. Thermal Index values greater than 1 alert the user to proceed with more caution.

If the Thermal Index value is below 0.4, it does not need to be displayed.

Description of Applied Parts

Depending on the type of transducer used, two different levels of protection are possible with the system.

The following transducers provide a "Class 1 type B" level of protection according to IEC601-1: 1988:

- 1.6 MHz PW
- 2 MHz PW
- 4 MHz CW/PW
- 8 MHz CW/PW

The following transducers provide a "Class 1 type CF" level of protection according to IEC601-1: 1988 when used in conjunction with their appropriate preamplifier pod:

- 16 MHz PW
- 20 MHz PW

EMC Statement

The system conforms to the EMC regulation standards as stated in the Regulatory Compliance (H1) section of this manual. This instruction manual must be adhered to in order to ensure compliance to these standards. The following points are especially important:

- Only equipment supplied or recommended by the manufacturer or their authorized distributors can be connected to the system.
- Ensure all external connections to the non-medical equipment are securely fixed, paying particular attention to any securing screws or clips on the connectors.
- In certain circumstances e.g. in the vicinity of surgical diathermy equipment, interference signals may be heard and observed. This will be obvious to the user. This is common to all Doppler equipment and it is the responsibility of the user to discriminate between normal and noise signals and to ignore or delete these erroneous signals. This does not represent a safety hazard and the system will recover without any operator intervention once the source of the interference has been removed.
- When using the Doppler probes near to monitors, keyboards etc. tone lines may be observed or heard due to emissions from these devices. This is not a fault with the system. If this occurs move the probes away from items to avoid these problems.
- Ensure no mobile telephones are used near the system.
- If interference is a continuing problem, the system should be moved to a different location, or measures should be undertaken to resolve the source of the interference by the user. If none of these measures resolve the problem, contact the manufacturer or their authorized distributors.

Chapter H2
Common Hardware Components

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This chapter provides information concerning the various components and accessories available as standard or optional with the Pioneer TC8080 and Companion III systems.

Information in this chapter is subject to change without notice.

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Remote Hand Controller

The system may be supplied with a multifunctional remote hand controller (See Figure 1). The hand controller has five user assignable function keys (S1 to S5). All of the other functions of the hand controller are marked on the hand controller itself.

The individual functions of the hand controller are described in chapters S2 and S3 in this manual.

Infrared Remote Control

The system is also supplied "Infrared remote control ready". The optional infrared remote control looks and works in the same manner as the plug-in type. The individual functions are the same.

Note: The infrared remote control should be pointed toward the IR receiver window (at the top center of the front of the Companion III system or next to the Pioneer label on the TC8080 system), in order for it to work effectively.

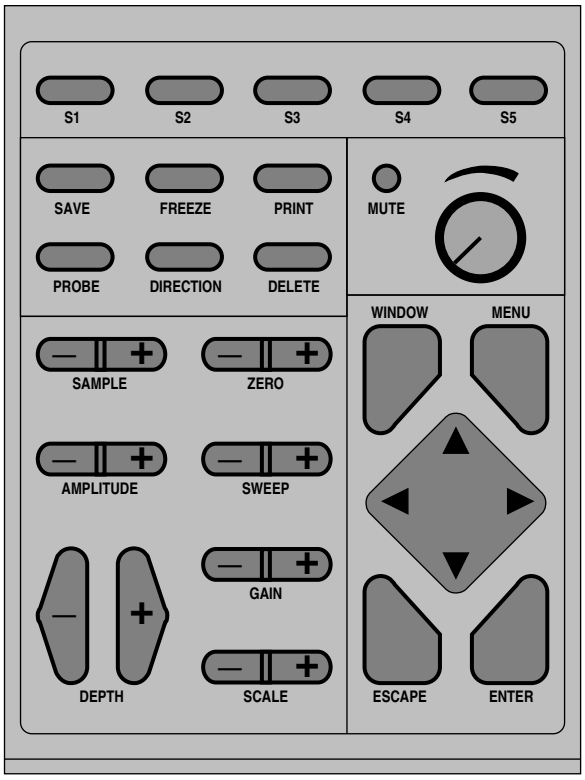

Figure 1: The remote control.

Note: Please refer to the Safety Summary (Chapter H1) concerning precautions using the infrared remote.

Note: With normal use, the batteries for the infrared remote should last for about one year. When the remote no longer operates the system, or operating range reduces, replace both batteries with new IEC LR03 AAA Alkaline Manganese batteries. To replace the batteries, remove the four screws at the back of the remote, remove the batteries from the holder and replace with new batteries. Be sure to fit the batteries the correct way around. Refit the rear cover and tighten the four screws.

- Don't leave flat batteries in the remote control.
- Always replace both batteries at the same time.
- In the case of battery leakage, clean the battery holder and replace the old batteries with new.
- Dispose of batteries carefully, in accordance with local regulations.
- Remove batteries if equipment is not likely to be used for a long time.

Footswitch

The system may be supplied with an optional three function footswitch (See Figure 1). The footswitch has three user assignable switches (F1 to F3).

The configurability and functionality of the footswitch is described in chapter S2 in this manual.

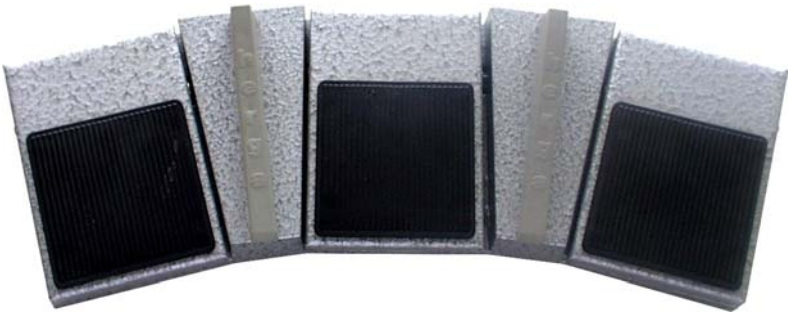

Figure 1: The footswitch.

Keyboard

The system is supplied with a standard keyboard (See Figure 2) for use in entering alpha-numeric data.

The functionality of the keyboard is described in chapter S2 in this manual.

Note: A smaller version keyboard containing a trackball pointing device is also available as an option.

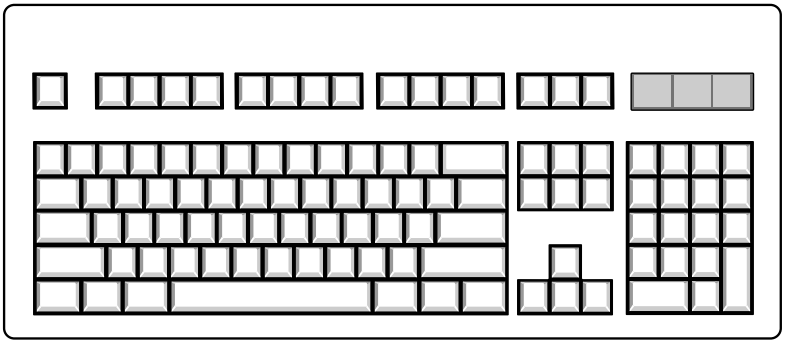

Figure 2: The keyboard.

Pointing Devices

The system may be supplied with an optional two button mouse (See Figure 1).

The system may also be supplied with an optional keyboard containing a trackball pointing device (See Figure 2).

A third type of pointing device which is available is the touchscreen display (See Figure 3).

The functionality of the three pointing devices is described in chapter S2 in this manual.

Note: The touchscreen display is only available on the Companion III system. Pioneer TC8080 systems and Companion III LE models do not support the touchscreen.

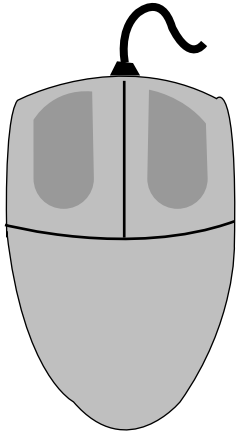

Figure 1: The mouse.

Figure 2: The trackball.

Figure 3: The touchscreen display.

Available Transducers

The following optional transducers are supported by the systems:

- 1.6 MHz PW Monitoring
- 2 MHz PW Monitoring
- 2 MHz PW Handheld
- 4 MHz PW/CW Extracranial
- 8 MHz PW/CW Extracranial
- 16 MHz PW Microvascular
- 20 MHz PW Microvascular

These are shown in the Figures on this page.

Note: Only the 2 MHz transducers are available with two different sizes of crystals (10mm and 15mm). The part descriptions contain the crystal width. Please keep in mind that the crystal width is not the same as the probe housing diameter. The probe housing diameter will always be greater.

Note: The microvascular transducers are available with two different diameters (1.5 and 2 mm). In this case, the diameter refers to the probe housing diameter and not the crystal size.

Figure 1: Transcranial Monitoring Transducer 1.6 or 2 MHz PW.

Figure 2: Transcranial Handheld Transducer 2 MHz PW.

Figure 3: Extracranial Transducer 4 MHz PW/CW.

Figure 4: Extracranial Transducer 8 MHz PW/CW.

Figure 5: Microvascular Transducer 16 or 20 MHz PW.

Note: The transcranial monitoring transducers have a removable handle which can be used to simulate a standard diagnostic handheld transducer.

Note: Certain transducers are also available with a longer 4.8 m cable instead of the standard 2.5 m cable. Refer to the Optional Accessories list later in this chapter for availability.

Analog Connection Box

The system may be supplied with an optional analog connection box to simplify the use of the eight analog inputs and eight analog outputs (See Figure 1).

For convenience, the connection of external devices should be made via the Analog Connection Box which contains eight standard RCA input connectors and eight standard RCA output connectors. Refer to Chapter H3 or H4 for a description of the proper connection procedure for the analog connection box.

The Pioneer TC8080 and Companion III systems support the ability to record and playback the audio Doppler data using an external DAT recorder. The configurability and functionality of the external inputs and outputs is described in chapter S17 in this manual.

Figure 1: Analog Connection Box.

Printers

Various types of printers are supported by the system. Essentially all printers which are supported by the Windows operating system can be used.

In the case that a color inkjet printer is used, it is recommended that the printer have both a color ink cartridge as well as a black ink cartridge.

Headphones

Standard audio headphones are supported by the system.

Consumables

The only available consumable for the system is a 250 ml bottle of ultrasonic coupling gel.

Note: Only accessories or consumables that are supplied or recommended by Nicolet EME or Nicolet Vascular should be used with the system.

Standard Pioneer Accessories

The **Pioneer TC8080** system is delivered as follows:

- Main unit with CD-RW, 3.5 inch floppy drive, four Doppler sockets, and stereo speakers.
- External Monitor with cables.
- Keyboard.
- Mouse.
- 2m Power (mains) lead.
- Microsoft Windows XP pack plus driver and installation disks and CDs.
- Adhesive Probe Holder.
- User Manual.
- NicVue Patient Administration Software CD and Manual.
- Bottle of Gel.

Note: Please ensure that the disks and CDs are kept with the system. A charge will be made for replacements.

Standard Companion Accessories

The **Companion III** system is delivered as follows:

- Main unit with CD-RW, 3.5 inch floppy drive, two Doppler sockets, stereo speakers, and probe holder.
- Internal Touchscreen Monitor.
- Keyboard.
- Mouse.
- 2m Power (mains) lead.
- Microsoft Windows XP pack plus driver and installation disks and CDs.
- User Manual.
- NicVue Patient Administration Software CD and Manual.
- Bottle of Gel.

Note: Please ensure that the disks and CDs are kept with the system. A charge will be made for replacements.

Note: The Companion III LE model does not support the touchscreen display. This system just has an internal LCD display.

Optional Accessories

The following is a list of the optional components available for the systems:

• 1.6 MHz PW 15mm monitoring transducer (probe) 2.5m	X1-P100	
• 2 MHz PW diagnostic handheld (probe) 2.5m	X1-P101	
• 2 MHz PW 15mm standard monitoring transducer (probe) 2.5m	X1-P102	
• 2 MHz PW 10mm monitoring transducer (probe) 2.5m	X1-P103	
• 4 MHz PW/CW active transducer (probe) 2.5m yellow	X1-P104	
• 8 MHz PW/CW active transducer (probe) 2.5m green	X1-P105	
• 1.5mm 16 MHz PW microvascular probe (Autoclaveable)	X1-P110	
• 2.0mm 16 MHz PW microvascular probe (Autoclaveable)	X1-P111	
• 1.5mm 20 MHz PW microvascular probe (Autoclaveable)	X1-P112	
• 2.0mm 20 MHz PW microvascular probe (Autoclaveable)	X1-P113	
• 16 MHz PW microvascular isolation pod	X1-P114	
• 20 MHz PW microvascular isolation pod	X1-P115	
• 1.6 MHz PW 15mm monitoring transducer (probe) 4.8m	X1-P120	
• 2 MHz PW 10mm standard monitoring transducer (probe) 4.8m	X1-P117	
• 2 MHz PW 15mm standard monitoring transducer (probe) 4.8m	X1-P116	
• Probe Carry Case	X2-P004	
• Probe Holder (Adhesive backed)	-	Pioneer only
• Infra-Red Remote Control (English)	M2-P001	
• Wired Remote Control (English)	M2-P002	
• Infra-Red Remote Control (German)	M2-P003	
• Wired Remote Control (German)	M2-P004	
• IR Remote Pod	M2-0516	
• Footswitch (3-way) for use with IR remotes	X2-P001	Pioneer & all Companion
• Footswitch (3-way) for use with wired remotes inc. RS232 PC card	X2-P002	Pioneer only
• Cherry Mini Keyboard	M2-0491	
• Keyboard including trackball	M2-0445	
• Microsoft Intellimouse Mouse	-	
• Analog Connection Box (8 Inputs / 8 Outputs)	340/SA/02	
• Analog Connection Kit (8 Inputs / 8 Outputs)	340/SA/19	Pioneer only
• Analog Connection Kit (8 Inputs / 8 Outputs)	340/SA/04	Companion only
• Knurr Pioneer Cart inc. Drawer	X9-0126	
• Knurr Cart Rear Cover	M1-P001	
• TFT Monitor	-	Pioneer only
• 17” Color Monitor	MN-0012	Pioneer only
• Hewlett Packard Color Printer inc Leads	RC-0029	
• Stereo Headphones	M2-0495	
• Service Manual Pioneer	M7-P002	
• Service Manual Companion	-	

Optional Accessories (continued)

• Reader Station Software	X9-0127 Pioneer & Companion
• Dual Headband for 15mm Probe	X2-P006
• Single Headband for 15mm Probe	X2-P007
• Dual Headband for 10mm Probe	X2-P012
• Single Headband for 10mm Probe	X2-P008
• Single 15mm Probe Holder Attachment	X2-P009
• Single 10mm Probe Holder Attachment	X2-P010
• Pack of 10 Headband Cushion Pads and 5 Velcro Top Straps	M2-0496

Chapter H3
Companion III System

Labels and Symbols	**H3-3**
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This chapter provides information concerning the assembly and set up of the Companion III system.

Information in this chapter is subject to change without notice.

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Labels and Symbols

The following labels and symbols are affixed to the **Companion III**:

Warns the user to consult this manual and any other accompanying documentation

Power (Mains) Supply OFF

O

Power (Mains) Supply ON

I

Stereo Headphones (3.5mm jack socket)

Potential Equalization Terminal

Mouse (Pointing Device) Connection

Keyboard Connection

RJ-45 Network Connection

USB (Universal Serial Bus) Connection

Parallel Printer Connection

Remote Controller Connector

Line Out (3.5mm jack socket)

Line In (3.5mm jack socket)

Microphone In (3.5mm jack socket)

Figure 1: Rear View of the Companion III.

1. Pointing Device Socket (Mouse/Track-Ball)
2. Keyboard Socket
3. Headphone Socket
4. Microphone Socket
5. Line Out Socket
6. Line In Socket
7. 25Way Parallel Printer Socket
8. RS232 Serial Interface Socket
9. Remote Control Socket
10. Analog Outputs Socket
11. Analog Inputs Socket
12. VGA Monitor Signal Socket
13. RJ-45 Network Socket
14. USB (Universal Serial Bus) Sockets
15. Power (Mains) Input Socket
16. Power (Mains) On/Off Switch
17. Power (Mains) Fuse Drawer
18. Equipotential Terminal
19. Transducer (Probe) Holder
20. Cooling Fan Vent
21. Carrying Handle

Figure 2: Front Quarter View of the Companion III.

22 Infra-Red Remote Control Window

23 Resistive VGA Touch Screen

24 Loudspeaker (Two On System)

25 CD-RW Drive

26 1.44MB 3½" Floppy Disk Drive

27 Transducer (Probe) Socket

28 Transducer (Probe) Socket

Connecting Accessories

To guarantee the highest level of safety, only accessories that have approval to EN 60601-1, and are CE marked in accordance with the Medical Devices Directive 93/42/EEC should be connected to the **Companion III**.

Connection of the **Companion III** to any mains powered electrical accessories must be in accordance with IEC 601-1-1 : 2000. This standard describes the safety requirements for medical electrical systems to provide protection to the patient, the operator and the surroundings.

For safety reasons accessories must not be connected to the same mains socket (e.g. via a multi socket adapter) as the **Companion III**.

Connection to mains powered electrical accessories that are not approved to EN 60601-1 will require additional protective earthing. An isolation transformer may also be required.

IEC 601-1-1 provides examples for various combinations of medical electrical equipment and non-medical electrical equipment.

When accessory devices have been connected, another safety check of the device combination will be necessary.

Connecting the Keyboard

The keyboard should be connected to the 6-way miniature DIN socket on the rear panel of the **Companion III** (socket 2).

Connecting the Pointing Device

The pointing device (mouse or track-ball) should be connected to the 6-way miniature DIN socket on the rear panel of the **Companion III** (socket 1).

Connecting an External Printer

The printer interface connector is a Centronics SPP 25-way standard D type socket fitted to the rear panel (connector 7). Connection to the external printer is via a 25 way parallel cable. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting the Optional Footswitch

An optional footswitch may be connected to the **Companion III**. Connect the footswitch to the RS-232 Serial Interface Socket (socket 8). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting the Remote Hand Controller

Connect the Remote Hand Controller to the RS-232 Serial connector (socket 8) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.
Please note that use of the remote hand controller *and* the footswitch precludes the use of other serial accessories.

Connecting a set of Headphones

Use stereo headphones with a 3.5mm, 3-pole (stereo) Jack plug. The connector (socket 3) is on the rear of the **Companion III**. The internal speakers will be automatically disconnected. The audio signals can now be heard via the headphones.

Connecting USB Peripherals

Two USB compatible peripherals may be connected to the USB ports (sockets 14) on the back panel.

Connecting the Companion III to a Network

It is possible to connect the **Companion III** to a network. Connect an RJ-45 compatible patch cable to the RJ-45 socket (socket 13) on the back panel. Consult a network administrator for setting up the networking protocols in the operating system.

Connecting an External VGA Monitor

An extra external VGA monitor may be connected to the **Companion III**. Connect the monitor signal cable to the VGA Monitor Signal Socket (socket 12). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting Serial Devices

Standard serial port compatible devices may be connected to the 9-way 'D type' RS 232 connector (socket 8) on the back panel of the **Companion III**. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. Please note that use of the remote hand controller *and* footswitch precludes the use of other serial accessories.

Connecting the Optional Analog Connection Box

An optional analog connection box may be connected to the **Companion III**. Connect the analog connection box (2 cables) to the Analog Inputs / Outputs Sockets (sockets 10, 11). Ensure that the cables are fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting an External DAT Recorder

If an external DAT recorder is to be used to record and playback the Doppler audio data via the analog connection box, it needs to be properly connected. Two channels of audio information for each Doppler FFT display are required and these need to be connected in the correct order for the accurate reproduction of the Doppler FFT flow direction from the stored audio signals. Make sure that the left and right DAT channels are connected consistently for both the inputs and the outputs. e.g. Left to connector 1 and right to connector 2 for both the inputs and the outputs.

Connecting the Standard Transducers to the System

CAUTION

Make sure you align the red dots in step 1 to guard against damage to the transducer and/or system connectors.

1. Align the **Red dots** on both the system (sockets 27 and 28) and the transducer connectors (Figure 1).
2. Push the transducer connector straight in all of the way.

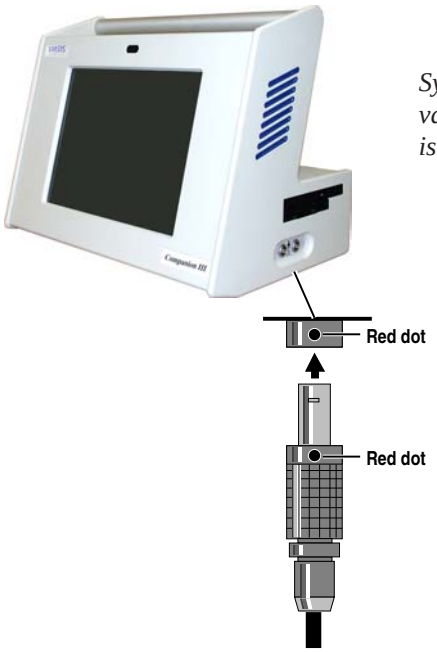
Disconnecting a transducer from the Companion III system

Use this procedure to disconnect a transducer from the system.

CAUTION

Do not pull on the transducer's cable or damage to the transducer and/or system may occur.

1. Grasp the **knurled sleeve** of the transducer's connector (Figure 2).
2. Carefully pull the transducer connector straight out from the system connector.



System model may vary from that which is shown.

Figure 1: Align the red dots and push the transducer straight into the connector on the system.

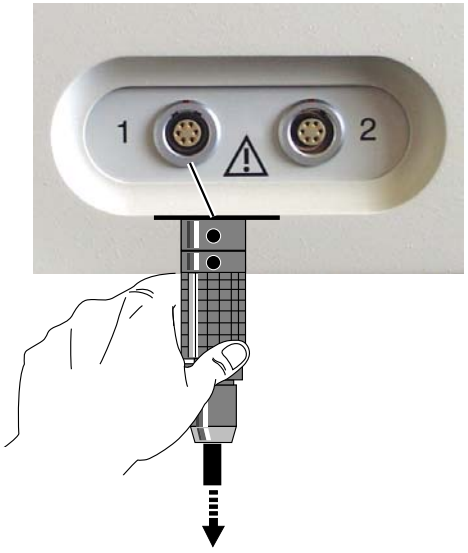


Figure 2: Grasp the knurled sleeve and pull straight out to remove the transducer.

Your system's layout and components may differ from the examples shown above and in the remainder of this guide.

Connecting the Microvascular Probes to the System

The microvascular probes have been designed to be as small as possible, thereby allowing access to microvessels in very restricted areas. Because of the invasive nature of microvascular applications, the probes are sterilizable. Consequently, the microvascular probe and the preamplifier (pod) have been separated.

CAUTION

Never autoclave the microvascular pod (preamplifier) or immerse the pod in a liquid.

1. Connect the microvascular preamplifier to the system as shown in Figure 1 using the same procedure as the standard transducers on the previous page.

2. Connect the microvascular probe to the preamplifier as shown in Figure 2 by simply pressing the probe connector onto the preamplifier.

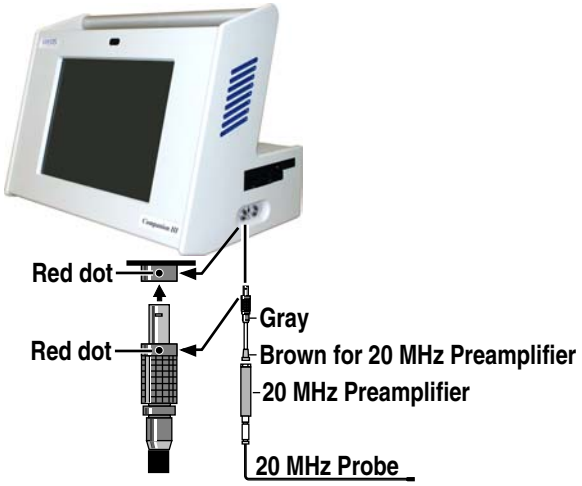


Figure 1: Two channel Companion III main unit showing the 20 MHz microvascular pod and the 20 MHz probe connected to Channel 1.

Figure 2: Connecting the microvascular probe to the preamplifier.

Note: The Strain Relief is WHITE on the 16 MHz preamp and BROWN on the 20 MHz preamp.

Assembling the System

Refer to the Front and Back Panel diagrams and legend for socket, connector and other locations.

1. Carefully unpack all of the system components and make sure none are missing or damaged (refer to the shipping list supplied with the system).

2. Ensure that the Power (Mains) Switch (16) is in the O Off position before continuing the set-up procedure.

3. If a printer is to be used, plug the 25-way Centronics printer cable from the printer to the 25-Way Parallel Printer Socket (7) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

4. Connect the keyboard plug to the Keyboard Socket (2) on the back panel.

5. Connect the pointing device (mouse or track-ball) to the Pointing Device Socket (1) on the back panel.

6. If the unit is to be connected to a network, plug an RJ-45 compatible patch cable into the RJ-45 socket (socket 13) on the back panel.

7. If any USB peripherals are to be used with this unit, connect them to the USB Sockets (14) on the back panel.

8. Connect the remote hand controller to the Remote Hand Controller Socket (9) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

9. If the optional footswitch is to be used with this unit, connect the footswitch to the RS-232 Serial Interface Socket (socket 8). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

10. If a second VGA monitor is to be used with this unit, connect the monitor signal cable to the VGA Monitor Signal Socket (socket 12). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

11. If the optional analog connection box is to be used with this unit, connect the analog connection box (2 cables) to the Analog Inputs / Outputs Sockets (sockets 10, 11). Ensure that the cables are fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. In addition, make sure that the external device (e.g. DAT recorder) is also properly connected.

12. Plug the Power (Mains) Lead into the Power (Mains) Inlet (1) on the rear of the unit, and into a suitable wall socket.

13. The unit is now ready to be switched on.

Mains Power Supply

The **Companion III** can automatically detect and set itself for voltages between110V and 240V. Before connecting the **Companion III** to a mains electrical supply, check that the Power (Mains) Switch is set to off then connect any peripherals and accessories required.

Apply power to the Companion III system

After assembling the system and connecting the **Companion III** to the power (mains) supply, it may be switched on. The Power (Mains) Switch (16) is on the rear of the **Companion III** next to the power input socket.

When the unit is off, the switch should be at position “O”. To switch on the **Companion III**, ensure that a mains cable is connected to the system and a power socket, and push the switch to position “I”.

Figure 1: System power switch.

Note: The unit will perform some self-tests before ‘booting’ into Windows; the time this takes may vary depending on other software or peripherals added to the **Companion III**. The Windows screen will be displayed when the unit is ready. Please note that the exact number and type of icons shown on the screen may differ depending on the software or hardware installed.

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Chapter H4
Pioneer TC8080 System

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This chapter provides information concerning the assembly and set up of the Pioneer TC8080 system.

Information in this chapter is subject to change without notice.

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Labels and Symbols

The following labels and symbols are affixed to the **Pioneer TC8080**:

Warns the user to consult this manual and any other accompanying documentation

Power (Mains) Supply OFF

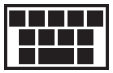
Power (Mains) Supply ON

Stereo Headphones (3.5mm jack socket)

Potential Equalization Terminal

Mouse (Pointing Device) Connection

Keyboard Connection



RJ-45 Network Connection

USB (Universal Serial Bus) Connection

Parallel Printer Connection

VGA Monitor Signal Connection

RS-232 Serial Connnection

Line Out (3.5mm jack socket)

Line In (3.5mm jack socket)

Microphone In (3.5mm jack socket)

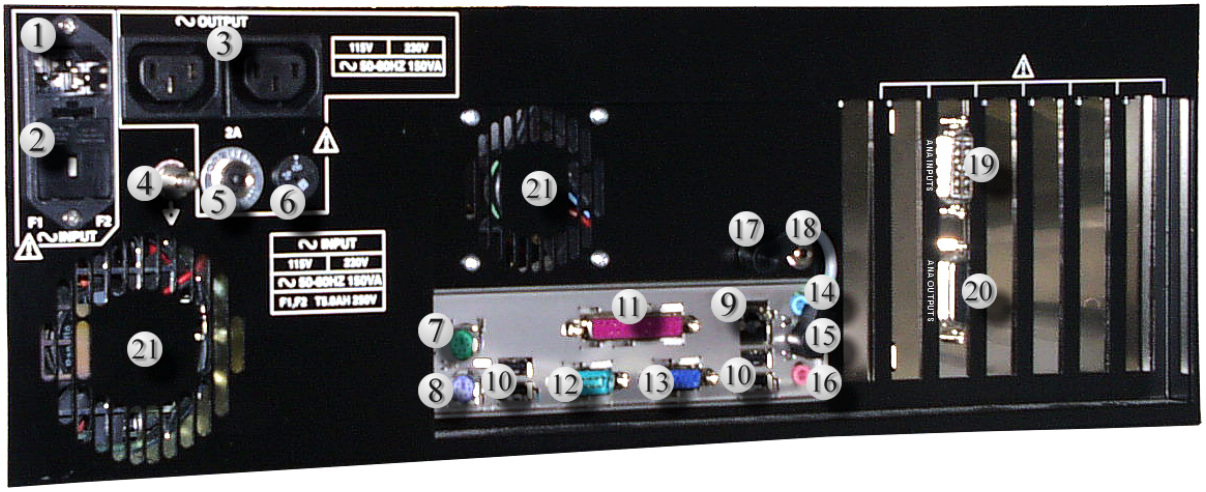


Figure 1: Back Panel of the Pioneer TC8080.

1. Power (Mains) Inlet
2. Fuse Drawer and Input Voltage Selector
3. Isolated Power (Mains) Outlets
4. Potential Equalization Terminal
5. Thermal Circuit Breaker
6. Isolated Power Output Voltage Selector Switch
7. Pointing Device Socket
8. Keyboard Socket
9. RJ-45 Network Socket
10. 2 USB Sockets
11. 25-Way Parallel Printer Socket
12. VGA Monitor Signal Socket
13. RS-232 Serial Port Socket
14. Line In Socket
15. Line (Audio) Out Socket (connect to 17 only)
16. Microphone In Socket
17. Line (Audio) In Socket (connect to 15 only)
18. Line (Audio) Out Socket
19. Analog Inputs Socket
20. Analog Outputs Socket
21. Cooling Fan Exhaust Vents

Figure 2: Front Panel of the Pioneer TC8080.

22 Stereo Headphone Socket

23 Hard Disk Activity Indicator

24 IrDA Window

25 Loudspeakers

26 Transducer (Probe) Sockets

27 Spare 5¼” Drive Bays

28 CD Writer / Rewriter

29 3½” Floppy Disk Drive

30 Power (Mains) Switch

Connecting Accessories

To guarantee the highest level of safety, only accessories that have approval to EN 60601-1, and are CE marked in accordance with the Medical Devices Directive 93/42/EEC should be connected to the **Pioneer TC8080**.

Connection of the **Pioneer TC8080** to any mains powered electrical accessories must be in accordance with IEC 601-1-1 : 2000. This standard describes the safety requirements for medical electrical systems to provide protection to the patient, the operator and the surroundings.

For safety reasons accessories must not be connected to the same mains socket (e.g. via a multi socket adapter) as the **Pioneer TC8080**.

Connection to mains powered electrical accessories that are not approved to EN 60601-1 will require additional protective earthing. An isolation transformer may also be required.

IEC 601-1-1 provides examples for various combinations of medical electrical equipment and non-medical electrical equipment.

When accessory devices have been connected, another safety check of the device combination will be necessary.

Connecting the Keyboard

The keyboard should be connected to the 6-way miniature DIN socket on the rear panel of the **Pioneer TC8080** (socket 8).

Connecting the Pointing Device

The pointing device (mouse or track-ball) should be connected to the 6-way miniature DIN socket on the rear panel of the **Pioneer TC8080** (socket 7).

Connecting an External Printer

The printer interface connector is a Centronics SPP 25-way standard D type socket fitted to the rear panel (connector 11). Connection to the external printer is via a 25 way parallel cable. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. The printer should be powered from one of the power outlets (3) on the TC8080.

Connecting the Optional Footswitch

An optional footswitch may be connected to the **Pioneer TC8080**. Connect the footswitch to the RS-232 Serial Interface Socket (socket 13). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. Please note that use of the footswitch precludes the use of other serial accessories.

Connecting the Remote Hand Controller

Connect the Remote Hand Controller to the RS-232 Serial connector (socket 13) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.
Please note that use of the remote hand controller precludes the use of other serial accessories.

Connecting a set of Headphones

Use stereo headphones with a 3.5mm, 3-pole (stereo) Jack plug. The connector (socket 22) is on the rear of the **Pioneer TC8080**. The internal speakers will be automatically disconnected. The audio signals can now be heard via the headphones.

Connecting USB Peripherals

Two USB compatible peripherals may be connected to the USB ports (sockets 10) on the back panel.

Connecting the Pioneer TC8080 to a Network

It is possible to connect the **Pioneer TC8080** to a network. Connect an RJ-45 compatible patch cable to the RJ-45 socket (socket 9) on the back panel. Consult a network administrator for setting up the networking protocols in the operating system.

Connecting an External VGA Monitor

An extra external VGA monitor may be connected to the **Pioneer TC8080**. Connect the monitor signal cable to the VGA Monitor Signal Socket (socket 12). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting Serial Devices

Standard serial port compatible devices may be connected to the 9-way 'D type' RS 232 connector (socket 13) on the back panel of the **Pioneer TC8080**. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. Please note that use of the remote hand controller *or* footswitch precludes the use of other serial accessories.

Connecting the Optional Analog Connection Box

An optional analog connection box may be connected to the **Pioneer TC8080**. Connect the analog connection box (2 cables) to the Analog Inputs / Outputs Sockets (sockets 19, 20). Ensure that the cables are fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

Connecting an External DAT Recorder

If an external DAT recorder is to be used to record and playback the Doppler audio data via the analog connection box, it needs to be properly connected. Two channels of audio information for each Doppler FFT display are required and these need to be connected in the correct order for the accurate reproduction of the Doppler FFT flow direction from the stored audio signals. Make sure that the left and right DAT channels are connected consistently for both the inputs and the outputs. e.g. Left to connector 1 and right to connector 2 for both the inputs and the outputs.

Connecting the Standard Transducers to the System

CAUTION

Make sure you align the red dots in step 1 to guard against damage to the transducer and/or system connectors.

1. Align the **Red dots** on both the system (sockets 26) and the transducer connectors (Figure 1).
2. Push the transducer connector straight in all of the way.

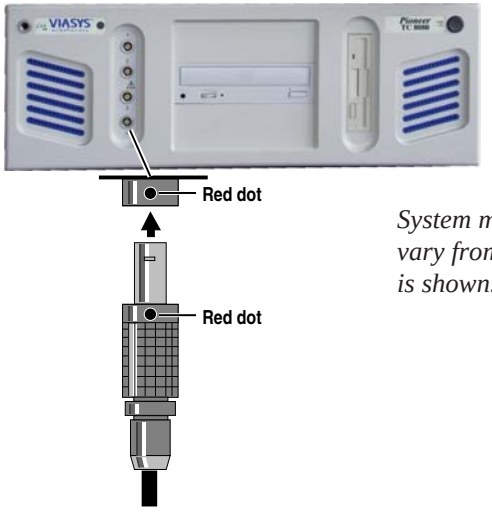
Disconnecting a transducer from the Pioneer TC8080 system

Use this procedure to disconnect a transducer from the system.

CAUTION

Do not pull on the transducer's cable or damage to the transducer and/or system may occur.

1. Grasp the **knurled sleeve** of the transducer's connector (Figure 2).
2. Carefully pull the transducer connector straight out from the system connector.



System model may vary from that which is shown.

Figure 1: Align the red dots and push the transducer straight into the connector on the system.

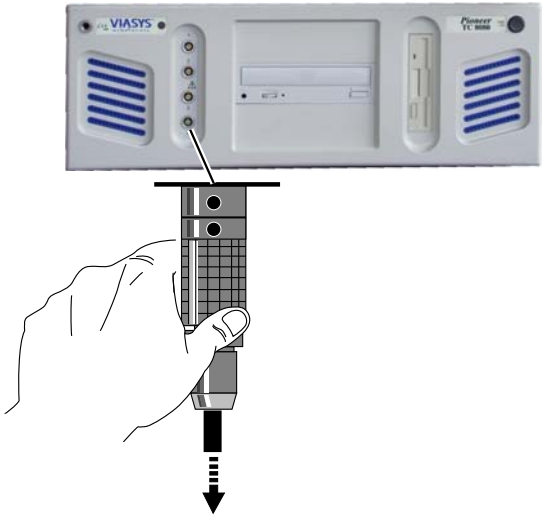


Figure 2: Grasp the knurled sleeve and pull straight out to remove the transducer.

Your system's layout and components may differ from the examples shown above and in the remainder of this guide.

Connecting the Microvascular Probes to the System

The microvascular probes have been designed to be as small as possible, thereby allowing access to microvessels in very restricted areas. Because of the invasive nature of microvascular applications, the probes are sterilizable. Consequently, the microvascular probe and the preamplifier (pod) have been separated.

! CAUTION

Never autoclave the microvascular pod (preamplifier) or immerse the pod in a liquid.

1. Connect the microvascular preamplifier to the system as shown in Figure 1 using the same procedure as the standard transducers on the previous page.

2. Connect the microvascular probe to the preamplifier as shown in Figure 2 by simply pressing the probe connector onto the preamplifier.

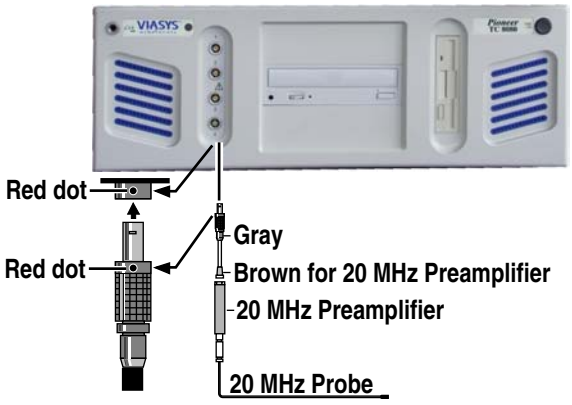


Figure 1: Four channel Pioneer TC8080 main unit showing the 20 MHz microvascular pod and the 20 MHz probe connected to Channel 4.

Figure 2: Connecting the microvascular probe to the preamplifier.

Note: The Strain Relief is WHITE on the 16 MHz preamp and BROWN on the 20 MHz preamp.

Assembling the System

Refer to the Front and Back Panel diagrams and legend for socket, connector and other locations.

1. Carefully unpack all of the system components and make sure none are missing or damaged (refer to the shipping list supplied with the system).

2. Place the components on the cart using Figure 1 on the next page for guidance.

3. Ensure that the Power (Mains) Switch (30) is in the “O” Off position before continuing the set-up procedure.

4. Set the Power Voltage Selector Switches (2) and (6) to the required voltage for the country in which the **TC 8080** is to be used.

5. Plug the monitor power lead from the monitor power inlet to a Power Outlet (3) on the back panel. Plug the monitor signal lead into the VGA Monitor Signal socket (12) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

6. Plug the printer power lead from the printer power inlet to a Power Outlet (3) on the back panel. Plug the 25-way Centronics printer cable from the printer to the 25-Way Parallel Printer Socket (11) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

7. Connect the keyboard plug to the Keyboard Socket (8) on the back panel.

8. Connect the pointing device (mouse or track-ball) to the Pointing Device Socket (7) on the back panel.

9. If the unit is to be connected to a network, plug an RJ-45 compatible patch cable into the RJ-45 socket (socket 9) on the back panel.

10. If any USB peripherals are to be used with this unit, connect them to the USB Sockets (10) on the back panel.

11. Connect the remote hand controller to the Remote Hand Controller Socket (13) on the back panel. Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

12. If the optional footswitch is to be used with this unit, connect the footswitch to the RS-232 Serial Interface Socket (socket 13). Ensure that the cable is fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance.

13. Connect the audio bypass lead to the Line Out Socket (15), and to the Line In Socket (17).

14. If the optional analog connection box is to be used with this unit, connect the analog connection box (2 cables) to the Analog Inputs / Outputs Sockets (sockets 19, 20). Ensure that the cables are fully screened and the connector jackscrews are fully tightened. This will ensure reliability and EMC compliance. In addition, make sure that the external device (e.g. DAT recorder) is also properly connected.

15. Plug the Power (Mains) Lead into the Power (Mains) Inlet (1) on the rear of the unit, and into a suitable wall socket.

16. The unit is now ready to be switched on.

Figure 1: Pioneer TC8080 system on a cart.

Note: Depending on the country of distribution, the cart model may vary.

Mains Power Supply

The **Pioneer TC 8080** can be set-up to run on either 100-120V, or 200-240V AC electrical supplies. Before connecting the **Pioneer TC 8080** to a mains electrical supply, check that the Power (Mains) Selector Switches are set to the correct voltage. *Do not change the switch setting whilst the unit is switched on.*

Set to 115V for 100 - 120V
Set to 230V for 200 - 240V

Apply power to the Pioneer TC8080 system

After assembling the system and connecting the **Pioneer TC8080** to the power (mains) supply, it may be switched on. The Power (Mains) Switch (30) is on the front of the **Pioneer TC8080** next to the **TC8080** label.

When the unit is off, the switch should be at position “O”. To switch on the **Pioneer TC8080**, ensure that a mains cable is connected to the system and a power socket, and push the switch to position “I”.

Figure 1: System power switches.

Note: When the unit has been ‘shut-down’ in Windows, the power to the motherboard, HDD, CD-RW, FDD, and any PCI and USB peripherals is automatically disconnected. The Transducer Probe Sockets (26), the internal audio amplifier, and the Power (Mains) Outlets are still live until the Power (Mains) Switch is set to position “O” Off.

Note: The unit will perform some self-tests before ‘booting’ into Windows; the time this takes may vary depending on other software or peripherals added to the **Pioneer TC8080**. The Windows screen will be displayed when the unit is ready. Please note that the exact number and type of icons shown on the screen may differ depending on the software or hardware installed.

Chapter H5
Care and Maintenance of the Equipment

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Servicing the Instrument **H5-8**

This chapter provides information concerning the care and maintenance of the Pioneer TC8080 and Companion III systems.

Information in this chapter is subject to change without notice.

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Cleaning the Equipment

WARNING

Disconnect from 'mains' supply before cleaning the unit.

CAUTION

Care should be taken to allow NO liquid ingress into the unit, the keyboard/trackball, the SVGA monitor or printer.

Keyboard

- The keyboard case and keys may be cleaned using a damp, soft, lint free cloth.
- Do not use any petroleum based solvents such as ethanol, as this may damage the plastic components used in the keyboard construction.
- Do not pour or spray cleaning solutions directly onto the keyboard, as this could result in electrical failure of the keyboard.

Mouse

- The ball and underside of the mouse should be regularly cleaned using a soft, lint free cloth and mild detergent.
- Do not use any petroleum based solvents such as ethanol, as this may damage the components used in the construction.
- To remove the ball, turn the ball collar anti-clockwise.
- The ball can now be removed by inverting the mouse to allow the ball to fall into the palm of the hand.
- Blow gently into the mouse housing, or wipe out with a soft cloth to remove any dust, or lint that might have collected. If the mouse remains 'sluggish', try using a cotton swab to clean the bearings and rubber rollers.
- Refitting is the reverse of removal.

SVGA Monitor

- Clean the cabinet, panel and controls with a soft cloth moistened with a mild detergent solution.
- Do not use any type of abrasive pad, scouring powder or solvent.

Printer

- Use a soft cloth moistened with water to wipe dust, smudges and stains off the exterior case.
- Do not use any type of abrasive pad, scouring powder or solvent.

Pioneer TC8080 Base Unit

- Using a soft lint free cloth lightly moistened with a mild detergent solution, gently wipe the exterior surfaces of the base unit. Take great care to allow no liquid ingress into any of the connectors on the rear panel, or the disk drive, CD-RW, connectors and power switch on the front panel.
- Using a soft brush, remove any dust from the fan grilles located on the rear panel.

Companion III System Box

- Using a soft lint free cloth lightly moistened with a mild detergent solution, gently wipe the exterior surfaces of the base unit excluding the touch screen monitor. Take great care to allow no liquid ingress into any of the connectors or power socket/switch on the rear panel, or the disk drive, CD-RW and connectors on the side panel.
- Using a soft brush, remove any dust from the fan grilles located on the rear panel.

Touch Screen Monitor

- Wipe the screen lightly with a soft lint-free cloth. If necessary, a *small* amount of detergent may be used.
- Do not use any type of abrasive pad, scouring powder or solvent.

Cart System

- Using a soft lint free cloth moistened with a mild detergent solution, wipe all of the surfaces to remove any dust, smudges or stains.

Care of Transducers

Transducers are particularly sensitive. Please observe the following points:

- Do not drop or knock against a hard surface.
- Regularly clean off remains of contact gel.
- Do not immerse in fluids.
- Do not pull on the transducer cable.

! CAUTION

Rough handling of the transducers (probes) can cause severe damage to the ceramic crystals.

Cleaning Standard Transducers

The 1.6 MHz, 2 MHz, 4 MHz, and 8 MHz probes should be cleaned using the following procedure:

1. Clean the Doppler Transducers (Probes) using a soft, lint free cloth moistened with a mild cleaning agent. Do not use solvents or alcohol! Do not immerse the probes or sensors.

! CAUTION

Do not heat or autoclave any of the standard transducers.

Cleaning the Microvascular Transducers

The 16 MHz and 20 MHz probes should be cleaned using the following procedure:

1. Clean the Microvascular Transducers (Probes) using a soft, lint free cloth moistened with a mild cleaning agent. Isopropyl-alcohol and /or a mild disinfectant solution may also be used to clean these transducers.

Cleaning the Microvascular Pods

The Microvascular pods should be cleaned using the following procedure:

1. The pre-amplifier pod must not be sterilized as this could damage internal components and leave the pod unsafe for further use. Clean the pod and cable with a moist cloth dampened with isopropyl-alcohol or a disinfectant solution.

! CAUTION

Do not immerse the pod in liquid as this could damage internal components.

Sterilizing 16 MHz and 20 MHz Probes

The 16 MHz and 20 MHz probes can be sterilized using one of the following two procedures in the next column:

Note: Where ever appropriate, follow the sterile practice guidelines of your institution and the instructions from the manufacturer of the sterilizing unit. However, **NEVER** exceed the temperature listed in the following procedures.

! CAUTION

Always separate the EME microvascular pod (preamplifier) from the probe before sterilizing the probe. Never autoclave the microvascular pod (preamplifier) or immerse the pod in a liquid.

1. Autoclave at 134º Celsius (273º Fahrenheit) for 3 minutes. For the cool down procedure, see the time table pertaining to the specific autoclave unit being used. Remove the transducer from the autoclave and cool to room temperature.
2. Autoclave at 121º Celsius (250º Fahrenheit) for 15 minutes. For the cool down procedure, see the time table pertaining to the specific autoclave unit being used. Remove the transducer from the autoclave and cool to room temperature.

! CAUTION

Refer to the documentation and instructions that accompany the microvascular pod and transducers for additional cleaning and sterilising information.

Durability of Probes

The sterilization procedures recommended will not affect the performance of the probes. However the frequent washing and handling will increase the likelihood of damage. Consequently the recommendation is a maximum of 20 washing/sterilization cycles after which the probe must be replaced.

! WARNING

Any transducer that shows signs of damage should be replaced immediately. DO NOT USE transducers with cracked or exposed parts or bare wires. Patient safety will be compromised.

! CAUTION

Use only Nicolet approved / supplied electrodes and transducers. See your Nicolet distributor or call in the USA. Use of non-approved electrodes or transducers might adversely affect the function of your system.

! WARNING

The preceding instructions are subject to change without notice. Always follow the specific procedures that accompanied the parts (e.g., microvascular probes); your institution's guidelines for cleaning, disinfecting and sterilizing parts; and the instructions from the manufacturer of the sterilizing unit. However the probe sterilization temperature must NEVER exceed the values listed on this page or damage to the probe may result.

User Maintenance Companion III

In case of a fault, User Maintenance is limited to the following:

If the Companion III system does not 'power-up'

- Check that the 'mains' power supply lead is connected to the Power (Mains) Inlet (15), is connected to a suitable 'mains' outlet, and is switched on.
- Check the Power (Mains) Switch (16), is in the 'on' position.
- Check the Power (Mains) Input fuses in the Fuse Drawer (17). Input 'mains' fuses are accessed by pulling out the fuse drawer located beside the Power (Mains) Switch (16). *Ensure that the Power (Mains) Lead is disconnected and the unit is switched of before accessing the fuses.* Replacement fuses are as follows: Two off T2.5AH 250V 20mm fuses to 'IEC 127' should be fitted.
- Check the 'mains' fuse in the 'mains' plug (if fitted).

If the pointing device (mouse/ trackball) does not work:

- Ensure that the mouse connector is connected to the Pointing Device Socket (1).
- Clean the mouse, inside and out as described earlier in this chapter.

If the keyboard does not work:

- Ensure that the keyboard connector is connected to the Keyboard Socket (2) on the rear panel.

If the printer does not work:

- Ensure that the printer connector is connected to the 25-Way Parallel Printer Socket (7) on the rear panel, and to the Centronics connector on the printer.
- Check that there is enough ink in the cartridges contained in the printer and a paper supply in the printer's hopper.

If there is no sound from the loudspeakers:

- Select 'Start/Settings/Control Panel' then open 'Sounds and Multimedia'. Ensure that the Sound Volume option in the Sounds tab is not set hard over to the left.
- Double-click the loudspeaker icon just left of the clock in the taskbar. Ensure that none of the sliders have a tick mark in the 'Mute' box.

User Maintenance Pioneer TC8080

In case of a fault, User Maintenance is limited to the following:

If the Pioneer TC8080 system does not 'power-up'

- Check that the Voltage Selector Switches (2) and (6) are set to the correct voltage for the country in which the system is being used.
- Check that the 'mains' power supply lead is connected to the Power (Mains) Inlet (1), is connected to a suitable 'mains' outlet, and is switched on.
- Check the Power (Mains) Switch (30), on the front panel, is in the 'on' position.
- Check that the voltage selector *inside* the Fuse Drawer (2) is installed the right way round. On 100-120V systems the '115' side should be visible; on 200-240V systems the '230' side should be visible.

- Check the Power (Mains) Input fuses in the Fuse Drawer (2). Input 'mains' fuses are accessed by disconnecting the 'mains' power supply lead and pulling out the fuse drawer located below the Power (Mains) Inlet (1). Replacement fuses are as follows:
  Two off T5AH 250V 20mm fuses to 'IEC 127' should be fitted.

- Check the 'mains' fuse in the 'mains' plug (if fitted).

If the unit 'powers-up', but the SVGA monitor is blank:

- Check that the monitor power lead is connected between the monitor and the IEC outlet on the rear of the unit.

- Check the power switch on the monitor is in the 'on' position.

- Check the Thermal Circuit Breaker on the rear panel has not 'tripped'.

- Isolated 'mains' outputs for the external monitor and printer are protected by a 2A Thermal Circuit Breaker (5). This is located on the rear panel below the Isolated Power Outlets (3).

- In normal operation the inner black button should be approximately 3mm proud of the plastic bezel. If a fault has *occurred* with the isolated power output and the circuit breaker has 'tripped', the inner black button will be approximately 6mm proud of the plastic bezel. Check the state of the thermal circuit breaker if the monitor and/or printer fail to power up.

- Should the circuit breaker trip, switch off the Pioneer TC8080 system and disconnect from the mains supply. The monitor and printer must be checked for electrical safety and operation by an authorized and qualified service engineer before further use. Following the safety checks and fault rectification, depress the inner button on the circuit breaker, reconnect all items and power up.

If the monitor is blank with yellow 'Power Saving' LED On:

- Check that the monitor signal lead (15-way density and a half 'D' connector) is connected to the VGA Monitor Signal Socket on the rear of the unit.

If the color on the screen is not uniform:

- If the monitor is close to any potential sources of magnetic fields, color may not be uniform. Try to move the monitor away from the source.

- A degauss cycle is initiated whenever the monitor is switched on and can be manually initiated from the 'Menu/Option' on screen display on the monitor.

If the picture is fuzzy:

- Adjust the brightness, contrast and convergence controls.

- A degauss cycle is initiated whenever the monitor is switched on and can be manually initiated from the 'Menu/Option' on screen display on the monitor.

If the mouse does not work:

- Ensure that the mouse connector is connected to the Pointing Device Socket (8).

- Clean the mouse, inside and out as described earlier in this chapter.

If the keyboard does not work:

- Ensure that the keyboard connector is connected to the Keyboard Socket (7) on the rear panel.

Servicing the Instrument

If User Maintenance is unable to solve a fault in the instrument then Servicing will be required. Service must be exclusively carried out by the authorised distributor:

Nicolet Vascular Inc.
A Subsidiary of VIASYS Healthcare
5225 Verona Road
Building 2
Madison, WI 53711
USA

US Toll Free: 1 800 525 2519
US Toll: 1 608 441 2266
US FAX: 1 608 441 2232

Or the manufacturer:

SciMed Ltd.
Unit 5, Avon Business Park
Lodge Causeway
Fishponds
Bristol BS16 3JP
United Kingdom

Tel: +44 (0)117 958 3754
Fax: +44 (0)117 958 4089

or persons explicitly authorized by the above.

If unauthorized persons attempt service, then all responsibility passes to the customer and all warranties become void.

Chapter H6
Technical Specification

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This chapter provides technical specifications for both the Pioneer TC8080 and Companion III systems.

Information in this chapter is subject to change without notice.

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PC Specifications

Companion III System

- Industrial Style AXIOM SBC 8361 VEA or improved variant motherboard.
- Intel Pentium III 850 MHz Processor (minimum).
- 256 MB DIMM RAM (minimum).
- 80 GB fixed hard disk storage (minimum).
- 1.44 MB HD floppy disk storage.
- Internal DVD-RW Drive.
- On board Graphics Adapter.
- 6 Wire Resistive touch screen.

Pioneer TC8080 System

- Intel Desktop Board D815EEA (or equivalent). Incorporating:
- On board Intel 82815 AGP video controller.
- On board Soundmax integrated digital audio.
- Intel Pentium III 1 GHz Processor (minimum).
- 512 MB DIMM RAM.
- 120 GB fixed hard disk storage (minimum).
- 1.44 MB HD floppy disk storage.
- Internal DVD-RW Drive.
- Medical grade ATX 200W PSU.

Doppler Specifications

- 1.6MHz, 2MHz, 4MHz and 8MHz transducer (probe) frequencies.
- 16MHz and 20MHz Microvascular transducer (probe) frequencies available via isolation pod.
- 64, 128, or 256 point FFT.
- High-resolution FFT frequency spectrum analysis with up to 64 levels of color display.

- 1.6MHz, 2MHz, 4MHz and 8MHz transducer (probe) frequencies.
- 16MHz and 20MHz Microvascular transducer (probe) frequencies available via isolation pod.
- 64, 128, or 256 point FFT.
- High-resolution FFT frequency spectrum analysis with up to 64 levels of color display.

Doppler Specifications (Continued)

Companion III System

- Real time maximum frequency envelope.
- Frequency response: 75 Hz to 32 kHz.
- Wall Filter:
  75 Hz to 600 Hz (switchable).
- Selectable sweep rates 1 sec to 41 sec, depending on the number of channels displayed.
- Acoustic reproduction of the Doppler signals via two broadband loudspeakers or optional stereo headphones, flow separated or non-directional.
- Noise reduction toggle for high sound quality.
- Squelch/gel mute control.
- Boost control, 2 or 3 levels.
- Up to 8 depths on any channel.
- Up to 2 transducers (probes) running simultaneously.
- Fixed single frequency operation at any one time.

Pioneer TC8080 System

- Real time maximum frequency envelope.
- Frequency response: 75 Hz to 32 kHz.
- Wall Filter:
  75 Hz to 600 Hz (switchable).
- Selectable sweep rates 1 sec to 41 sec, depending on the number of channels displayed.
- Acoustic reproduction of the Doppler signals via two broadband loudspeakers or optional stereo headphones, flow separated or non-directional.
- Noise reduction toggle for high sound quality.
- Squelch/gel mute control.
- Boost control, 2 or 3 levels.
- Up to 8 depths on any channel.
- Up to 4 transducers (probes) running simultaneously.
- Choice of any 2 frequencies running simultaneously.

Inputs / Outputs Specifications

Companion III System

- 2 Self detecting active Doppler transducer (probe) sockets.
- Infrared remote hand controller sensor.
- 6-way mini DIN mouse/ pointing device socket.
- 6-way mini DIN keyboard socket.
- Microphone socket.
- Line in socket.
- Line out socket.
- Stereo headphone socket.
- 2 USB sockets
- RJ-45 network connector.
- 25-way parallel printer connector.
- SVGA monitor connector.
- Analogue/Audio (8 channels in/out) 15-way D-plug and socket.
- 2 RS 232 serial port connectors.

Pioneer TC8080 System

- 4 Self detecting active Doppler transducer (probe) sockets.
- Infrared remote hand controller sensor.
- 6-way mini DIN mouse/ pointing device socket.
- 6-way mini DIN keyboard socket.
- Microphone socket.
- Line in socket.
- Line out socket.
- Stereo headphone socket.
- 2 USB sockets
- RJ-45 network connector.
- 25-way parallel printer connector.
- SVGA monitor connector.
- Analogue/Audio (8 channels in/out) 15-way D-plug and socket.
- RS 232 serial port connector.
- Joystick / MIDI socket.

Analog / Audio I/O Specifications

(Available as an optional accessory)

Companion III System

- Analog/Audio Inputs (8 channels - Curves or 4 pairs Phase/Quad). Voltage up to 10Vpp with adjustable gain. Input impedance 100 kOhm. PRF sample rate compatible with all Companion and Pioneer systems (Maximum 31.7 kHz).
- Analog/Audio Outputs (8 channels - Curves or 4 pairs Phase/Quad). Voltage up to 10Vpp. Output impedance 100 Ohm.

Pioneer TC8080 System

- Analog/Audio Inputs (8 channels - Curves or 4 pairs Phase/Quad). Voltage up to 10Vpp with adjustable gain. Input impedance 100 kOhm. PRF sample rate compatible with all Companion and Pioneer systems (Maximum 31.7 kHz).
- Analog/Audio Outputs (8 channels - Curves or 4 pairs Phase/Quad). Voltage up to 10Vpp. Output impedance 100 Ohm.

System Feature Specifications

- Remote hand controller wired or infrared.
- Windows 2000 or Windows XP operating system environment.
- Interface to Nic Vue patient database.
- Support for all Windows compatible printers.
- 12.1 inch 800 x 600 TFT screen with touch screen technology.
- IBM PS/2 style QWERTY keyboard with integral pointing device.

- Remote hand controller wired or infrared.
- Windows 2000 or Windows XP operating system environment.
- Interface to Nic Vue patient database.
- Support for all Windows compatible printers.
- CRT / TFT LCD color monitor with up to 1280 x 1024 resolution.
- IBM PS/2 style QWERTY keyboard with integral pointing device.

Regulatory Compliance Specifications

- See Chapter H1.

- See Chapter H1.

	Companion III System	Pioneer TC8080 System
Environmental Requirements Specifications	• Storage temperature: -20ºC to +60ºC. • Storage humidity: 8% to 80% (relative, non-condensing). • Storage atmospheric pressure: 500 hPa to 1060 hPa. • Operating temperature: 10ºC to 40ºC. • Operating humidity: 15% to 80% (relative, non-condensing). • Operating atmospheric pressure: 700 hPa to 1060 hPa.	• Storage temperature: -20ºC to +60ºC. • Storage humidity: 8% to 80% (relative, non-condensing). • Storage atmospheric pressure: 500 hPa to 1060 hPa. • Operating temperature: 10ºC to 40ºC. • Operating humidity: 15% to 80% (relative, non-condensing). • Operating atmospheric pressure: 700 hPa to 1060 hPa.
Measurements and Weights Specifications	• 325 mm x 405 mm x 290 mm (height x width x depth). • Weight: 9 kg (approximately).	• 180 mm x 495 mm x 455 mm (height x width x depth). • Weight: 15kg (approximately).
Mains Supply Specifications	• 100 V to 240 V AC 50/60 Hz, 150 VA.	• 100 V to 120 V AC 50/60 Hz and 200 V to 240 V AC 50/60 Hz 350 VA switchable. • Integrated 150 VA isolation transformer powering 2 integrated power outlets.
Fuse Rating Specifications	• 2 x T2.5AH 250V 20mm to IEC Sheet III.	• 2 x T5.0AH 250V 20mm to IEC Sheet III.

Acoustic Output Specifications

The following pages provide information on the ultrasound intensity output of the Pioneer TC8080 and Companion III systems. The data for each transducer is presented in an individual table. Refer to Figure 1 on this page for a list of the symbols used and their definitions.

Measurement Uncertainties

The associated measurement uncertainties are as follows:

Power = +29%, -37%

Intensity = +18%, -22%

Pressure = +9%, -12%

Center Frequency = +1.5%, -1.5%

MI = Mechanical Index
TIS_{SCAN} = Soft tissue Thermal Index in auto-scanning mode
$TIS_{NON\text{-}SCAN}$ = Soft tissue Thermal Index in non auto-scanning mode
TIB = Bone Thermal Index
TIC = Cranial Thermal Index

A_{aprt} = Area of active aperture (cm^2)
$P_{r.3}$ = Derated peak rarefactional pressure

W_o = Ultrasonic Power, except for TIS_{SCAN} in which case it is the ultrasonic power passing through a 1 cm^2 window (mw)

$W_3(z_1)$ = Derated ultrasonic power at axial distance z_1

$I_{TA.3}(z_1)$ = Derated spatial-peak, temporal-average intensity at axial distance z_1 (mW/cm^2)

z_1 = Axial distance corresponding to location of max $[\min(W_{.3}(z), I_{TA.3}(z) \times 1cm^2)]$ where $z > z_{bp}$ (cm)

$z_{bp} = 1.69(A_{aprt})^{0.5}$

For MI z_{sp} is the axial distance at which $P_{r.3}$ is measured; for TIB, z_{sp} is axial distance at which TIB is a maximum (i.e. $z_{sp} = z_{b.3}$) (cm)

$d_{eq}(z)$ = Equivalent beam diameter as a function of axial distance z, and is equal to $[(4/\Pi)(W_o/I_{TA}(z))]^{0.5}$ where $I_{TA}(z)$ is the temporal-average intensity as a function of z (cm)

f_c = Center frequency (MHz)
PD = Pulse Duration (µs)
PRF = Pulse Repetition Frequency

$p_r@PII_{max}$ = Peak rarefactional pressure where free-field spatial peal pulse intensity integral is a maximum (megapascals)

$I_{SPPA.3}$ = Derated spatial peak, pulse average intensity (W/cm^2)
FL= Focal Length, or aximuthal and elevational lengths if different (cm)

ROC = Radius Of Curvature (cm)

$d_{eq}@PII_{max}$ = Equivalent beam diameter where free-field spatial-peak pulse intensity integral is maximum (cm)

Figure 1: Symbols Used and Their Definitions.

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 1.6 MHz 15mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	na	na	na	2.3
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	-		-	136
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	-	-	-	1.6
	Dim of A_{aprt}	X (cm)		-	-	-	-	1.5
		Y (cm)		-	-	-	-	1.5
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	p_r @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	-	-		unfocused
		FLy (cm)		-	-	-		unfocused
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							100%
	PRF							5.3 kHz
	Sample Width							12

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 2 MHz 10mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	na	na	na	1.3
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	-		-	52
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	-	-	-	2.0
	Dim of A_{aprt}	X (cm)		-	-	-	-	1.0
		Y (cm)		-	-	-	-	1.0
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	-	-		unfocused
		FLy (cm)		-	-	-		unfocused
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							100%
	PRF							5.3 kHz
	Sample Width							12

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 2 MHz 15mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	na	na	na	1.9
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	-		-	115
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	-	-	-	2.0
	Dim of A_{aprt}	X (cm)		-	-	-	-	1.5
		Y (cm)		-	-	-	-	1.5
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	-	-		unfocused
		FLy (cm)		-	-	-		unfocused
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							100%
	PRF							7.9 kHz
	Sample Width							8

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 4 MHz				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 4 MHz				**Operating Mode: Continuous Doppler (CW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)

# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 8 MHz				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 8 MHz				**Operating Mode: Continuous Doppler (CW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	1.33	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	34.91		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	8	-	-	-
	Dim of A_{aprt}	X (cm)		-	0.7	-	-	-
		Y (cm)		-	0.35	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	unfocused	-		-
		FLy (cm)		-	unfocused	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude				100%			
	PRF				CW			
	Sample Width				CW			

(data provided where **global maximum** displayed index exceeds 1.0)

# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 16 MHz 1.5mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 16 MHz 2.0mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)

# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 20 MHz 1.5mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	pr @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Pioneer TC8080 and Companion III Acoustic Output Reporting Table for Track 3								
Transducer Model: 20 MHz 2.0mm diameter				**Operating Mode: Pulsed Doppler (PW)**				
Index Label			**MI**	**TIS**			**TIB**	**TIC**
				scan	non-scan		non-scan	
					A_{aprt} <=1	A_{aprt} >1		
Global Maximum Index Value			<1	na	<1	na	na	na
Assoc Acoustic Parameter	$P_{r.3}$	(mPa)	#					
	W_o	(mW)		-	#		-	-
	min of [$W_{.3}(Z_1)$,$I_{TA.3}(Z_1)$]	(mW)				-		
	Z_1	(cm)				-		
	Z_{bp}	(cm)				-		
	Z_{sp}	(cm)	#				-	
	$d_{eq}(Z_{sp})$	(cm)					-	
	f_c	(MHz)	#	-	#	-	-	-
	Dim of A_{aprt}	X (cm)		-	#	-	-	-
		Y (cm)		-	#	-	-	-
Other Information	PD	(usec)	#					
	PRF	(Hz)	#					
	p_r @ PII_{max}	(Mpa)	#					
	d_{eq} @ PII_{max}	(cm)					-	
	Focal Length	FLx (cm)		-	#	-		-
		FLy (cm)		-	#	-		-
	$I_{pA.3}$ @ MI_{max}		#					
Operating Control Conditions	Amplitude							
	PRF							
	Sample Width							

(data provided where **global maximum** displayed index exceeds 1.0)
# indicates that no data is reported because the associated index value < 1

Acoustic Output in IEC 1157 format of Pioneer TC8080 and Companion III

Parameter	2 MHz PW 15 mm	2 MHz PW 10mm	1.6 MHz TCD	4MHz CW
p_r(MPa)	0.35	0.33	0.47	0.165
I_{spta} (mW/cm^2)	356.1	222.9	505.8	590.0
System Settings[a]	P=max 8mm SVL	(max pr 9mm SVL) (max Ispta, 12mm SVL)	P=max 12mm SVL	P=max
I_p(mm)	35.8	21.3	35.3	7.5
w_{pb6}(mm)	6.3	4.6	5.8	5.0 x 1.5
prr(kHz)	7.9	5.3	5.3	---
srr(Hz)	---	---	---	---
Output Beam dimensions (mm)[b]	15Ø	10Ø	15Ø	7Ø half disk
f_{awf}(MHz)	2.0	2.0	1.6	4.0
Acoustic Power-up fraction	0%	0%	0%	0%
Acoustic Initialization fraction	100%	100%	100%	100%
Maximum Power (mW)	114.7	51.9	135.6	29.1
I_{ob}(mW/cm^2)	64.9	66.5	76.6	151.4
Power-up mode	N/A	N/A	N/A	N/A
Initialization Mode	D	D	D	cwD
Acoustic Output Freeze	No	No	No	No
I_{tt}(mm)	0	0	0	0
I_{ts}(mm)	0	0	0	0
Inclusive Modes	N/A	N/A	N/A	N/A

a RGD - Range Gated Depth
SVL - Sample Volume Length
S - Scale settings (PRF)
P - Power

b Ø denotes diameter

c Controllable by user

Acoustic Output in IEC 1157 format of Pioneer TC8080 and Companion III cont.

Parameter	4 MHz PW	8 MHz cwD	8 MHz PW	16 MHz 1.5mm PW Microvascular
p_r(MPa)	0.228	0.165	0.261	0.724
I_{spta} (mW/cm^2)	183.2	539.9	147.1	519.6
System Settings[a]	P=max, 4mm SVL	P=max	(max p_r, prr=2) (max I_{spta}, prr=31.7) 7mm SVL	P=max, 1.4mm SVL
l_p(mm)	7.5	7.9	7.7	1.5
w_{pb6}(mm)	5.0 x 1.5	6.0 x 2.1	5.6 x 2.4	0.58
prr(kHz)	31.7	---	31.7	31.7
srr(Hz)	---	---	---	---
Output Beam dimensions (mm)[b]	7Ø half disk	7Ø half disk	7Ø half disk	1Ø
f_{awf}(MHz)	4.0	8.0	8.0	16.0
Acoustic Power-up fraction	0%	0%	0%	0%
Acoustic Initialization fraction	100%	100%	100%	100%
Maximum Power (mW)	8.76	34.9	22.1	1.29
I_{ob}(mW/cm^2)	45.6	181.8	115.7	164.4
Power-up mode	N/A	N/A	N/A	N/A
Initialization Mode	D	cwD	D	D
Acoustic Output Freeze	No	No	No	No
l_{tt}(mm)	0	0	0	0
l_{ts}(mm)	0	0	0	0
Inclusive Modes	N/A	N/A	N/A	N/A

a RGD - Range Gated Depth
SVL - Sample Volume Length
S - Scale settings (PRF)
P - Power

b Ø denotes diameter

c Controllable by user

Acoustic Output in IEC 1157 format of Pioneer TC8080 and Companion III cont.

Parameter	16 MHz 2mm PW Microvascular	20 MHz 1.5mm PW Microvascular	20 MHz 2mm PW Microvascular	
p_r(MPa)	0.713	0.504	0.588	
I_{spta} (mW/cm^2)	549.1	268.8	316.15	
System Settings[a]	P=max 1.4mm SVL	P=max 1.4mm SVL	P=max 1.4mm SVL	
I_p(mm)	1.5	1.5	1.5	
w_{pb6}(mm)	0.58	0.54	0.54	
prr(kHz)	31.7	31.7	31.7	
srr(Hz)	---	---	---	
Output Beam dimensions (mm)[b]	1Ø	1Ø	1Ø	
f_{awf}(MHz)	16.0	20.0	20.0	
Acoustic Power-up fraction	0%	0%	0%	
Acoustic Initialization fraction	100%	100%	100%	
Maximum Power (mW)	1.96	0.38	0.69	
I_{ob}(mW/cm^2)	249.6	47.7	87.9	
Power-up mode	N/A	N/A	N/A	
Initialization Mode	D	D	D	
Acoustic Output Freeze	No	No	No	
I_{tt}(mm)	0	0	0	
I_{ts}(mm)	0	0	0	
Inclusive Modes	N/A	N/A	N/A	

a RGD - Range Gated Depth
SVL - Sample Volume Length
S - Scale settings (PRF)
P - Power

b Ø denotes diameter

c Controllable by user

Accuracy of Values Specifications

The Doppler parameters calculated and displayed in the Pioneer TC8080 and Companion III systems are all based on the FFT spectral display. The accuracy of the vertical and horizontal scales determine the accuracy of the parameter measurements. The following pages explain these measurements and provide tables containing their accuracies.

Vertical Scale Accuracy

The accuracy of the vertical scale of the FFT spectral display depends on two adjustable factors (the PRF and the FFT resolution) and can be calculated using the formula in Figure 1.

The best case accuracy on the velocity measurements result from using the lowest scale setting and the highest FFT resolution. The worst case accuracy on the velocity measurements result from using the highest scale setting and the lowest FFT resolution.

Accuracy of scale = +/- PRF / (2 * FFT Resolution)

Where: Accuracy of scale is expressed in cm/sec or kHz
PRF (full scale setting) is expressed in cm/sec or kHz
FFT resolution is expressed in number of points (64/128/256)

Examples

1. If the scale setting is -81 cm/sec -> +81 cm/sec and the FFT resolution is 256 points, then the accuracy of scale velocity = +/- 162 cm/sec / (2 * 256) = +/- 0.316 cm/sec

2. If the scale setting is -2.00 kHz -> +5.93 kHz and the FFT resolution is 128 points, then the accuracy of scale frequency = +/- 7.93 kHz / (2 * 128) = +/- 0.031 kHz

Figure 1: Formula for calculating the vertical scale accuracy.

Note: It is important to remember that the accuracy of measurement depends on the operator obtaining a good envelope curve for the signal as described in this guide.

Note: As explained in this guide, all measurements of velocity assume an insonation angle of zero degrees.

Note: The Gosling Pulsatility Index (PI) and the Pourcelot Resistance Index (RI) are calculations dependent on the accuracy of the MEAN, SYS, and DIA contained in the tables. Since these calculations are non linear, it is impossible to state the actual accuracy of measurement for the PI and RI. The accuracy of calculations depend on the nature of the signal.

Horizontal Scale Accuracy

The accuracy of the spectral time values (horizontal scale of the FFT spectral display) is dependent on one adjustable factor (the sweep speed) and can be calculated using the formula in Figure 1.

The best case accuracy on the spectral time resolution measurements result from using the fastest sweep speed. The worst case accuracy on the spectral time resolution measurements result from using the slowest sweep speed.

Accuracy of spectral time values = +/- Sweep speed / 512

Where: Accuracy of spectral time values is expressed in seconds
Sweep speed (full length spectrum) is expressed in seconds

Example

1. If the full spectral sweep speed is 4.1 seconds, then the accuracy of spectral time values = +/- 4.1 seconds / 512 = 0.008 seconds

Figure 1: Formula for calculating the spectral time value accuracy.

Note: The accuracy of the Spectral Time Cursors are dependent on the accuracy of the Spectral Time Resolution as expressed in the tables. The Spectral Time Cursors will have the same accuracy of measurement as the Spectral Time Resolution.

1.6 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.190	+/- 5.142	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.105	kHz
Peak Systolic Velocity (SYS)	+/- 0.190	+/- 5.142	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.105	kHz
End Diastolic Velocity (DIA)	+/- 0.190	+/- 5.142	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.105	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.080	Seconds

2 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.151	+/- 4.113	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.105	kHz
Peak Systolic Velocity (SYS)	+/- 0.151	+/- 4.113	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.105	kHz
End Diastolic Velocity (DIA)	+/- 0.151	+/- 4.113	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.105	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.081	Seconds

4 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.075	+/- 4.836	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.248	kHz
Peak Systolic Velocity (SYS)	+/- 0.075	+/- 4.836	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.248	kHz
End Diastolic Velocity (DIA)	+/- 0.075	+/- 4.836	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.248	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.081	Seconds

8 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.038	+/- 2.418	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.248	kHz
Peak Systolic Velocity (SYS)	+/- 0.038	+/- 2.418	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.248	kHz
End Diastolic Velocity (DIA)	+/- 0.038	+/- 2.418	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.248	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.081	Seconds

16 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.019	+/- 1.209	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.248	kHz
Peak Systolic Velocity (SYS)	+/- 0.019	+/- 1.209	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.248	kHz
End Diastolic Velocity (DIA)	+/- 0.019	+/- 1.209	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.248	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.081	Seconds

20 MHz Operation

	Best Case Accuracy	Worst Case Accuracy	Unit of Measure
Mean Velocity (MEAN)	+/- 0.015	+/- 0.967	cm/sec
Mean Frequency (MEAN)	+/- 0.004	+/- 0.248	kHz
Peak Systolic Velocity (SYS)	+/- 0.015	+/- 0.967	cm/sec
Peak Systolic Frequency (SYS)	+/- 0.004	+/- 0.248	kHz
End Diastolic Velocity (DIA)	+/- 0.015	+/- 0.967	cm/sec
End Diastolic Frequency (DIA)	+/- 0.004	+/- 0.248	kHz
Spectral Time Resolution	+/- 0.004	+/- 0.081	Seconds

Chapter S1
Introduction to WinTCD

What is WinTCD? **S1-3**

Performing Doppler Examinations **S1-3**

This chapter provides a basic introduction to the WinTCD software package which is used on both the Pioneer TC8080 and Companion III systems.

WARNING

In all cases, the original data must be reviewed if a clinical decision is involved.

WARNING

WinTCD is not intended for data acquisition on any non-medical device (such as a standard PC) that comes in direct electrical contact with a patient.

Information in this chapter is subject to change without notice.

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What is WinTCD?

WinTCD is a **T**rans**C**ranial **D**oppler ultrasound software package, which runs on either the Pioneer TC8080 system or the Companion III system. The following non-invasive methodologies are included:

- Diagnostic cerebrovascular and extracranial investigation.
- Extended-term unilateral, bilateral, and multilateral cerebrovascular monitoring.
- Microvascular studies.

Additional features include:

- Handheld transducers (1.6 MHz, 2 MHz, 4 MHz, and 8 MHz) can be applied to insonnate either intracranial or extracranial blood vessels, so that a record of vascular blood flow velocity can be generated. In routine diagnostic investigations, the transducers are usually hand-held, enabling signals of interest to be quickly insonnated and optimized.
- A 2 MHz monitoring transducer can be mounted in a headpiece and secured in position once a good Doppler signal is located.
- Up to two or four monitoring transducers can be used simultaneously depending on the hardware system.
- Microvascular transducers are also available:
  16 MHz Microvascular PW
  20 MHz Microvascular PW
- You can configure your system to display either Spectra or extended-term trend curves, copy windows (or any combination thereof) and additional information such as the mean velocity, etc., may be obtained.
- Extended-term trend curves are generated from the real-time analog waves which enable you to view data trends on a single screen.
- The software allows spectra to be labeled and saved to the hard disk.
- Information stored during the examination may be reviewed via the Nicolet NicVue TCD Review mode.
- SoundTrak recordings which allows the system to record both audio Doppler data and spectral data.

See your ***Nicolet NicVue User Guide*** that shipped with your system for instructions on using the NicVue program.

Performing Doppler Examinations

The systems are designed for trained and skilled personnel in collecting transcranial data and peripheral Doppler ultrasound from a test subject. This manual is intended to describe the controls and functions of the system and software only.

If information is needed on the basic principles and examination techniques, please refer to the vast amount of literature available. The standard work is:

Transcranial Doppler Sonography, edited by Rune Aaslid, published by Springer Verlag, Wien / New York, 1986.

For more information on available application training seminars, please contact Nicolet or your local Nicolet distributor.

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Chapter S2
Entering Commands

Mouse commands **S2-3**
Moving the mouse pointer S2-3
Selecting an option with the mouse S2-3

Using the touchscreen display **S2-4**

Keyboard commands **S2-5**
Underlined letter commands S2-5
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Entering text using the keyboard **S2-7**
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Entering text using the mouse and keyboard **S2-7**

Using the remote control **S2-8**

Using the footswitch **S2-9**

Resizing a window **S2-10**

Moving a window **S2-10**

Maximizing a window **S2-10**

This chapter describes the various methods of entering commands to your system:

- Mouse / Trackball
- Touchscreen Display
- Keyboard
- Remote Control
- Footswitch

It will be very beneficial to read through this chapter and become familiar with the various methods. You then can choose which method best meets your personal preference and continue with the next chapter.

Note: Although there are three methods for entering commands, not all three can be used for certain operations. For example, alphanumeric entries must by typed in via the keyboard and certain softkey commands can only be entered via the keyboard or remote control.

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Mouse commands

Your system can be controlled using a mouse. There are, however, some functions which can only be accessed by the remote control or the keyboard.

Note: If you use the mouse, you still must use the keyboard to type in characters and numbers.

Moving the mouse pointer

Lay the mouse on the mouse pad or your work station. When directed to move the mouse pointer to a specific object on the screen (this action is often referred to as ***click on***), simply drag the mouse in the appropriate direction to 'steer' the pointer on the screen (Figure 1).

Example: *To move the pointer upwards on the screen, slide the mouse away from you. To move it toward the left side of the screen, slide the mouse towards your left.*

Note: On certain systems a trackball built into the keyboard may be provided as a pointing device instead of a mouse. In order to 'steer' the pointer on the screen, just roll the ball with your finger in the desired direction. The two keys next to the trackball are the equivalent of the left and right mouse buttons.

Selecting an option with the mouse

1. Move the mouse pointer over the desired function.

Click means to quickly press and release the left mouse button (Figure 2) after positioning the pointer over the desired option or command.

2. If you are clicking on a checkbox ☑☐ or on a pulldown menu option, click the button once to make your choice. Unless otherwise noted in the instructions, assume that you will only be using the **LEFT** mouse button to **Single-click** a command (referred to as "click on ...").

   Sometimes you will be instructed to **Double-click** (quickly press and release the mouse button twice) to make a selection. Double-click abilities are noted in the procedures.

   Clicking the **RIGHT** mouse button over certain areas of the screen display (e.g., Doppler Parameters Boxes, Trend, or Event List) will open up a menu relevant to that specific area.

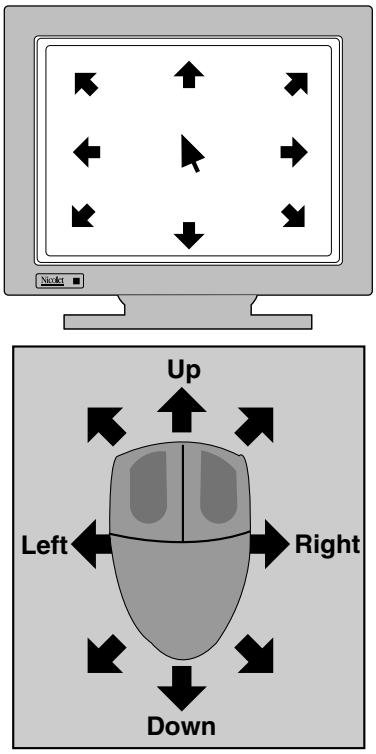

Figure 1: *Move the mouse in the direction you want to move the pointer on the display.*

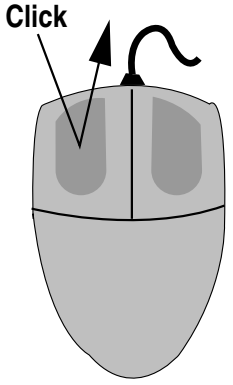

Figure 2: *Left clicking the Mouse*

Using the touchscreen display

The Companion III system is supplied standard with a touchscreen TFT display which can be used as a pointing device. This allows the system to be very portable since the mouse and trackball are not needed for the system.

Pulldown menu functions can be selected by pressing your finger against the touchscreen display on the pulldown menu name. The menu will then be shown on the screen similar to left mouse clicking on the menu name. The desired function in the menu can then be selected by pressing your finger against the touchscreen display on the function in the pulldown menu.

All icon functions in the toolbar can be used by simply pressing your finger against the touchscreen display on the desired icon.

S-key functions also work by pressing the screen over the function name.

Drag and drop functions can be executed by simply pressing your finger against the touchscreen display and sliding your finger across the display to the new position and then lifting your finger.

Figure 1: The touchscreen display can be used as a pointing device by pressing your finger against the screen.

Note: The desired functions can just be pressed on with your finger without having to first move the cursor position over the function and then pressing the left mouse button.

Note: If a double click function is needed, using the touchscreen, press your finger on the function two times in a similar way to the mouse button.

Note: If a right mouse button click is needed using the touchscreen, the small symbol in the lower right hand corner of the display should be pressed first to place the system in the mode that the next click will be a right mouse click and not a left mouse click.

Note: The touchscreen display is not available on the Pioneer TC8080 system or the Companion III LE model.

Keyboard commands

This section provides a short overview of various keyboard commands available for use with your system. If additional information about using the keyboard to enter commands is required, please refer to your *Windows User guide*.

Underlined letter commands

Whenever you see a letter underlined in a word displayed in a menu, you can use the keyboard to select that function.

To make your selection, hold down the **Alt** key (Figure 1) and then type the **underlined letter** (this procedure is typically described as **type Alt+letter**). The commands are not case sensitive; you can type a small letter or capital letter (e.g., a or A, b or B, etc.).

For example, note that the letter **D** is underlined in **Doppler** (Figure 2).

1. Type **Alt+d** (Alt and the lowercase letter d) or **Alt+D** (Alt and the uppercase letter D). A pull down menu listing various options from which you can choose appears (Figure 3).

Note: If you change your mind or type the wrong letter, you can exit from a menu by simply pressing the **Esc** key.

---

2. Go to the next page.

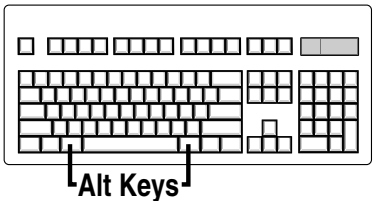

Figure 1: When a word has an underlined letter, hold down either Alt key and then type that letter to select that option from the screen.

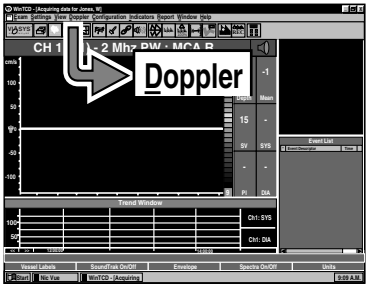

Figure 2: Type Alt+d to select the Doppler menu.

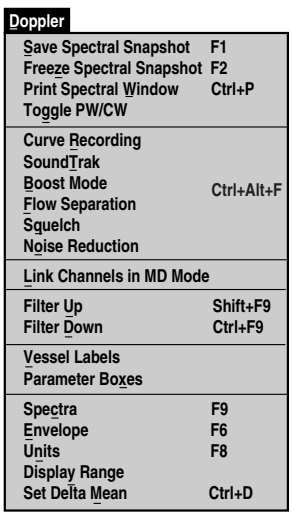

Figure 3: The Doppler pull down menu appears when Doppler is selected from the menu bar.

Pull down menu selections

Use the **Arrow** keys on the keyboard (or the Arrow keys on the remote control) to highlight the menu option you want to choose and then press **Enter** on the keyboard (or the remote control) or, if the option has an underlined letter, type **Alt+letter** as described on the previous page.

3. While watching the Indicators menu, press the **Down Arrow** key. Note that menu options displayed in black become highlighted as you press the **Down Arrow** key.

Note: Grayed menu options can not be selected because those options, for whatever reason, are disabled for use at that time.

4. Continue pressing the **Down Arrow** Key until **Settings** is highlighted (Figure 1).

   - or -

   Type **Alt+S** because the letter **S** in **Settings** is underlined.

5. The Indicators Settings window appears (Figure 2). At this time, simply press the Enter key on the keyboard to exit this window.

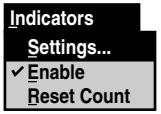

Figure 1: Type Alt + S or press the Down Arrow key on the keyboard until Settings is highlighted and then press Enter.

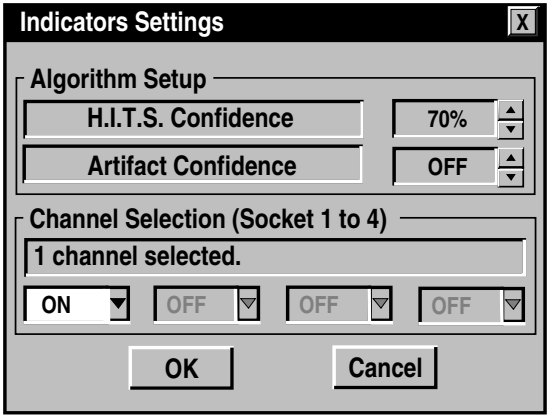

Figure 2: The Indicators Settings window appears.

Entering text using the keyboard

When using the keyboard to select a text area for editing, you will typically use the **Tab**, **Shift**, **Arrow**, and **Backspace** keys (see descriptions below).

1. When the desired text area is highlighted (or the desired characters have been deleted), type in the new text (or value).

Text edit command keys

Tab: Press the **Tab** key to move the text cursor 'forward' to the next text entry area.

Shift-Tab: Hold down the **Shift** key and press the **Tab** key to move the text cursor 'backwards' to the preceding text entry area.

Left/Right Arrows: Use the **Left/ Right Arrow** keys to move the text cursor left/right without deleting any characters.

Up/Down Arrows: For numerical entry areas, use the **Up/Down Arrow** keys to increment/ decrement the value by predefined steps set by the program.

Backspace: Press the **Backspace** key to delete the character to the left of the text cursor.

Entering text using the mouse and keyboard

You can use the mouse to select the text area into which you want to enter text or to edit. You will, however, still have to use the keyboard to type in the new information.

1. Position the mouse pointer inside the text area (usually enclosed with a box). The pointer changes to a Text Cursor (Figure 1).
2. If the text area is empty, click the **Left** mouse button and begin typing the new text.

- or -

3. If there is text already present in the text area,
   a. Move the Text Cursor to the beginning or ending of the text you want to edit (Figure 2).
   b. Hold down the **Left** mouse button and then drag the mouse (left or right) until all of the character(s) you want to edit are highlighted, and then release the mouse button (Figure 3).
   c. Type in the new text or value (Figure 4).

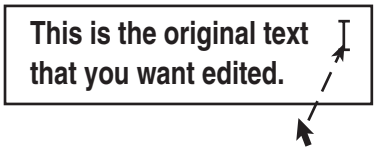

Figure 1: *The mouse Pointer was moved inside the Text Area and it changed to a Text Cursor.*

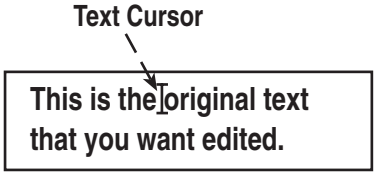

Figure 2: *The Text Cursor was moved to the beginning of the word 'original.'*

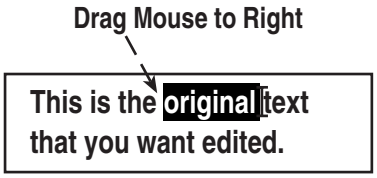

Figure 3: *The left mouse button was held down and the mouse was dragged to the right, thus highlighting the word 'original.' Release the mouse button.*

Figure 4: *The word 'NEW' was typed which replaced the word 'original.'*

Using the remote control

The five softkeys (S1 - S5) on the Remote Control correspond to the five keys displayed on the bottom of the screen display (Figure 1).

Each of the five keys have a specific function which, when pressed, will perform the assigned action. Holding the key down will repeat the function. The list of keys below depends on the mode of operation and is just a sample of the various functions. The keys can be labeled in any order:

- Indicators On/Off
- Envelope
- Filter Down
- Filter Up
- Toggle PW/CW
- Boost Mode
- SoundTrak On/Off
- Spectra On/Off
  etc.

You can customize the sequence of the keys to fit your personal preference. For example, you can assign Envelope to any one of the five softkeys by clicking the RIGHT mouse button on the softkey and then choosing from the list. Instructions for labeling these keys is located in the next chapter. The remaining keys on the remote control are assigned specific functions which are described in detail later in this guide.

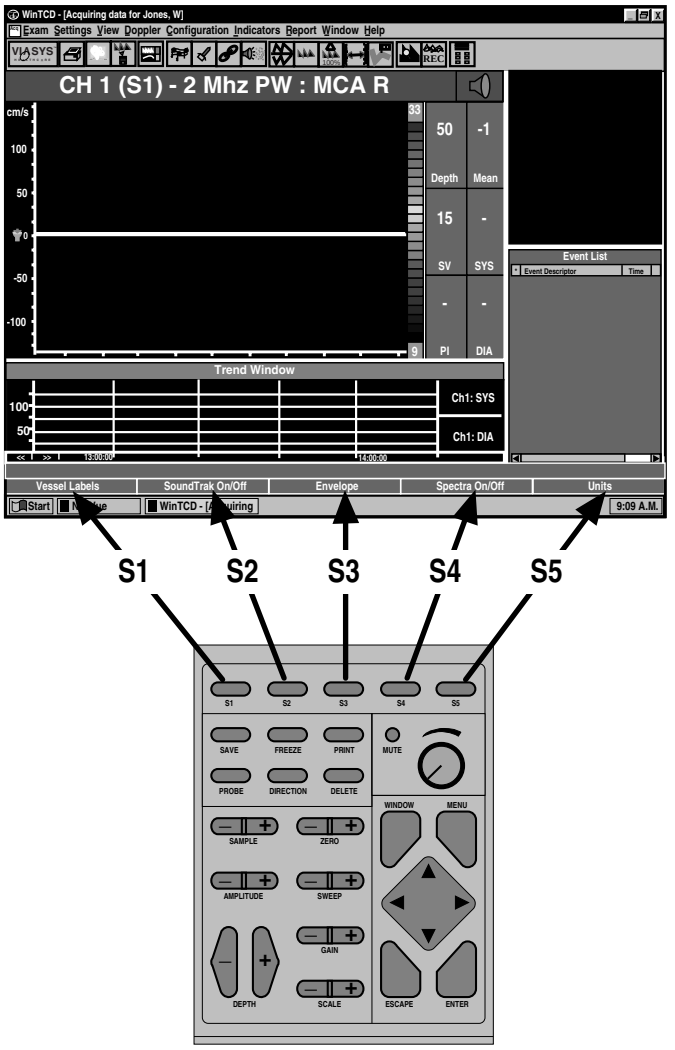

Figure 1: The five softkeys on the Remote Control correspond to the five keys displayed on the bottom of the screen display and can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window). A configuration menu can be accessed by selecting Configure S-Keys out of the pull down Configuration menu.

Note: A softkey function can not be assigned to multiple keys. If it has been assigned to a key already, it first must be removed from that key before you can reassign it to a different key.

Using the footswitch

The three footswitch keys (Figure 1) on the Footswitch do **not** have any correspondence to the five keys displayed on the bottom of the screen display (S-keys). These are completely independent configurable functions.

Each of the three keys have a specific function which, when pressed, will perform the assigned action. The list of keys below depends on the mode of operation and is just a sample of the various functions. There are many more footswitch functions compared to the S-keys since typically Doppler control functions will be configured and these already have a dedicated key on the remote control. The keys can be configured in any order:

- Indicators On/Off
- Envelope
- Filter Down
- Filter Up
- Toggle PW/CW
- Save Snapshot
- Depth Up
- Depth Down
- Freeze
- Units

  etc.

You can customize the sequence of the keys to fit your personal preference by using the configuration menu as shown in Figure 2 irregardless of whether the footswitch is connected or not.

Figure 1: Pressing one of the three footswitch keys will execute the configured command if the command is available in the present mode of operation. Holding the key down will repeat the function. Text messages are provided for user feedback.

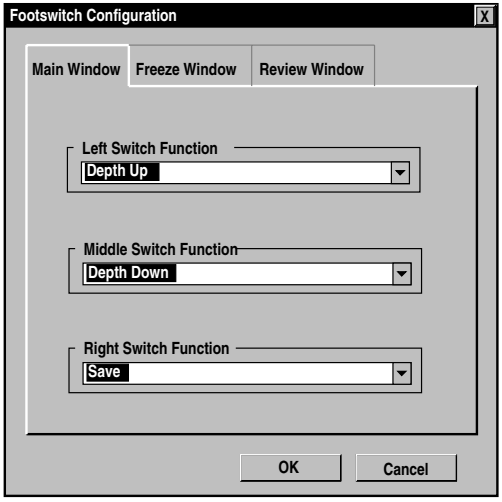

Figure 2: The three footswitch keys on the Footswitch can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window). This menu can be accessed by selecting Configure Footswitch out of the pull down Configuration menu.

Resizing a window

You can resize a window for display on the screen.

1. Move the mouse pointer to which ever edge you want to resize until the point changes into the resize symbol (Figure 1).

2. Hold down the mouse button and then drag the mouse in the desired direction to resize the window (Figure 2).

3. Release the mouse button when finished.

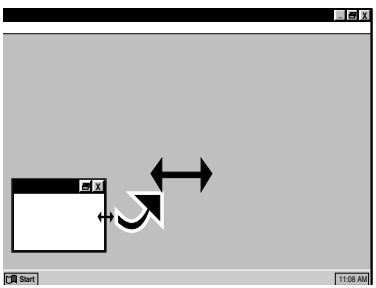

Figure 1

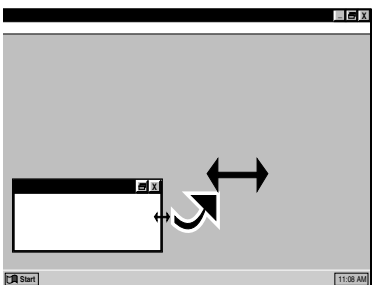

Figure 2

Moving a window

You can move a window on the display screen to view what may be located behind it or to just organize the displayed elements.

1. Move the mouse pointer over the window's Title Bar (Figure 3).

2. Hold down the mouse button and then drag the mouse in the desired direction (Figure 4).

3. Release the mouse button when finished.

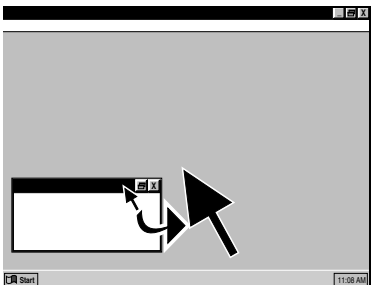

Figure 3

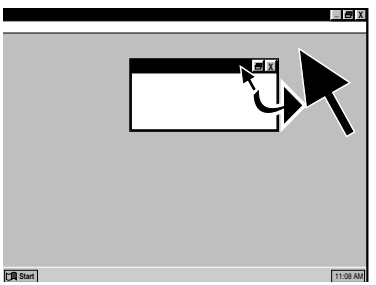

Figure 4

Maximizing a window

If, when you first open a file, the window does not fill the entire screen, it is recommended that you maximize the window to fill the entire screen for enhanced visibility.

1. In the upper right corner of the window, click on the **Restore** button (Figure 5).

2. The window enlarges and fills the entire screen (Figure 6).

3. Clicking on the same area again minimizes the screen to its original smaller size.

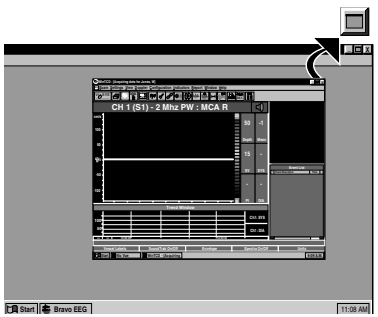

Figure 5

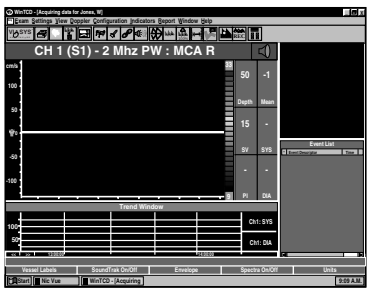

Figure 6

Chapter S3
Summaries

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Summary - Remote Control Functions **S3-16**

This chapter contains brief summaries of the various screen displays and remote control key functions used with your system. Detailed descriptions follow in later chapters.

Blank Page

Summary - Diagnostic Acquisition Screen Overview

Channel Socket/Probe/ Vessel Label
Shows channel, socket used, and the selected vessel label being used during the exam.

Minimize Button
Reduce WinTCD to an icon on the desktop. Click on the WinTCD icon to return the display.

Window Size Button
Reduce the size of the window. Restore the window to its original size

Exit Window Button
Close the window (Exit the WinTCD program).

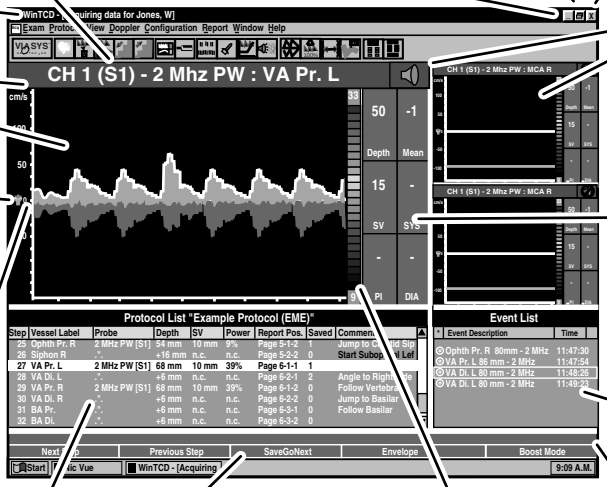
Speaker Mute
Click on to mute speaker; shows mute status.

Patient name

Flow Velocity Scale
(cm/s or kHz)

Doppler Window

Flow Direction Indicator
Red arrow = blood flow toward probe, above the Zero Baseline.
Blue arrow = blood flow away from probe, above the Zero Baseline.
To change flow direction, press the **Direction** key on the Remote Control.



Zero Baseline
Adjust vertical position of the spectral data using the **Zero** key on the Remote Control.

Protocol List
Displays a list of protocol steps from which you can choose by clicking on the Next Step, Previous Step, SaveGoNext, PrintGoNext buttons on the Softkey Status Bar. You can also quickly choose a step by double-clicking on the desired step.

Softkey Status Bar
Identifies the function of the softkeys on the remote control. To change softkey functions, click the **Right** mouse button on the softkey to view a menu.

Intensity Scale (dB)
Signal intensity can range from 0 to 64 dBs.

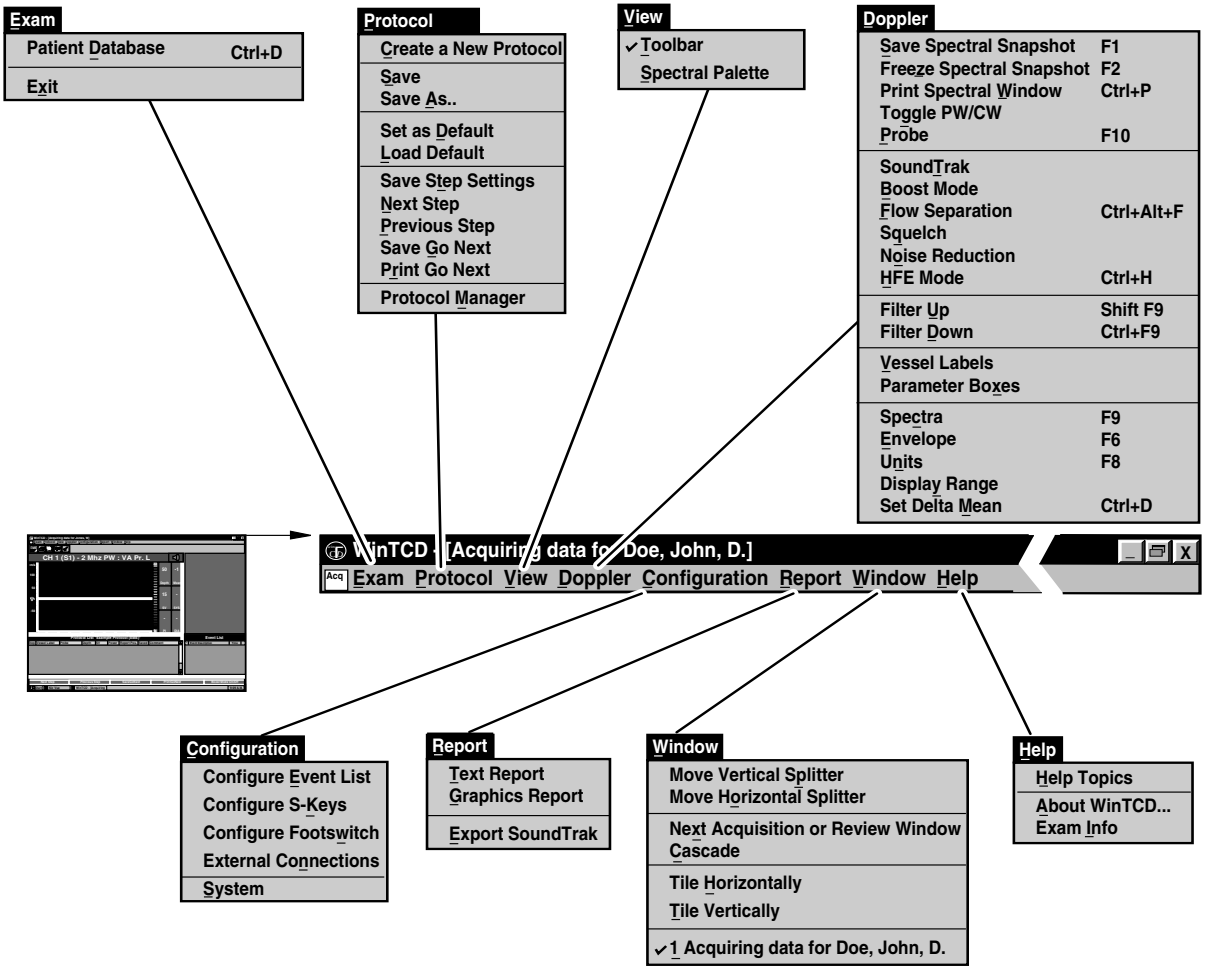
Copy Window
Displays the saved Doppler screens captured when the **Save** key on the Remote Control or F1 on the keyboard is pressed.

Parameter Boxes
Shows the current Doppler parameters. To choose from a menu of 12 options, click the **Right** mouse button anywhere inside this area.

Event List
Lists events that occurred during the exam.

Message Bar
Provides information to the user.

Summary - Diagnostic Acquisition Screen Menus



Summary - Monitoring Acquisition Screen Overview

Channel Socket/Socket/ Vessel Label
Shows channel, probe used, and the selected vessel label being used during the exam.

Minimize Button
Reduce WinTCD to an icon on the desktop. Click on the WinTCD icon to return the display.

Window Size Button
Reduce the size of the window. Restore the window to its original size

Exit Window Button
Close the window (Exit the WinTCD program).

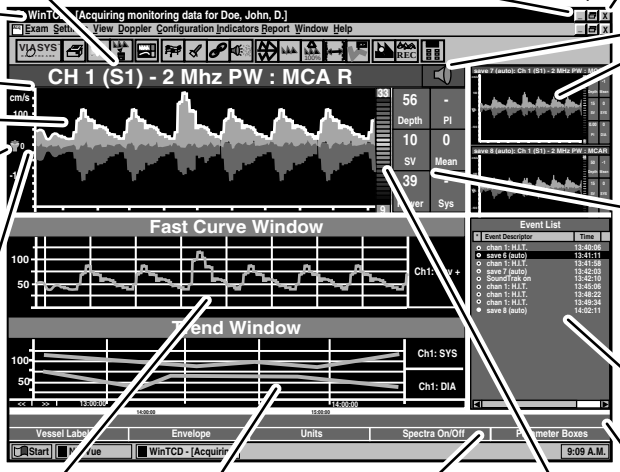
Speaker Mute
Click on to mute speaker; shows mute status.

Patient name

Flow Velocity Scale
(cm/s or kHz)

Doppler Window

Copy Window
Displays the saved Doppler screens captured when the **Save** key on the Remote Control or F1 on the keyboard is pressed to resave.



Flow Direction Indicator
Red arrow = blood flow toward probe, above the Zero Baseline.
Blue arrow = blood flow away from probe, above the Zero Baseline.
To change flow direction, press the **Direction** key on the Remote Control.

Parameter Boxes
Shows the current Doppler parameters. To choose from a menu of 13 options, click the **Right** mouse button anywhere inside this area.

Event List
Lists events (saved records, etc.) that occurred during the exam.

Zero Baseline
Adjust vertical position of the spectral data using the **Zero** key on the Remote Control.

Softkey Status Bar
Identifies the function of the softkeys on the remote control. To change softkey functions, click the **Right** mouse button on the softkey to view a menu.

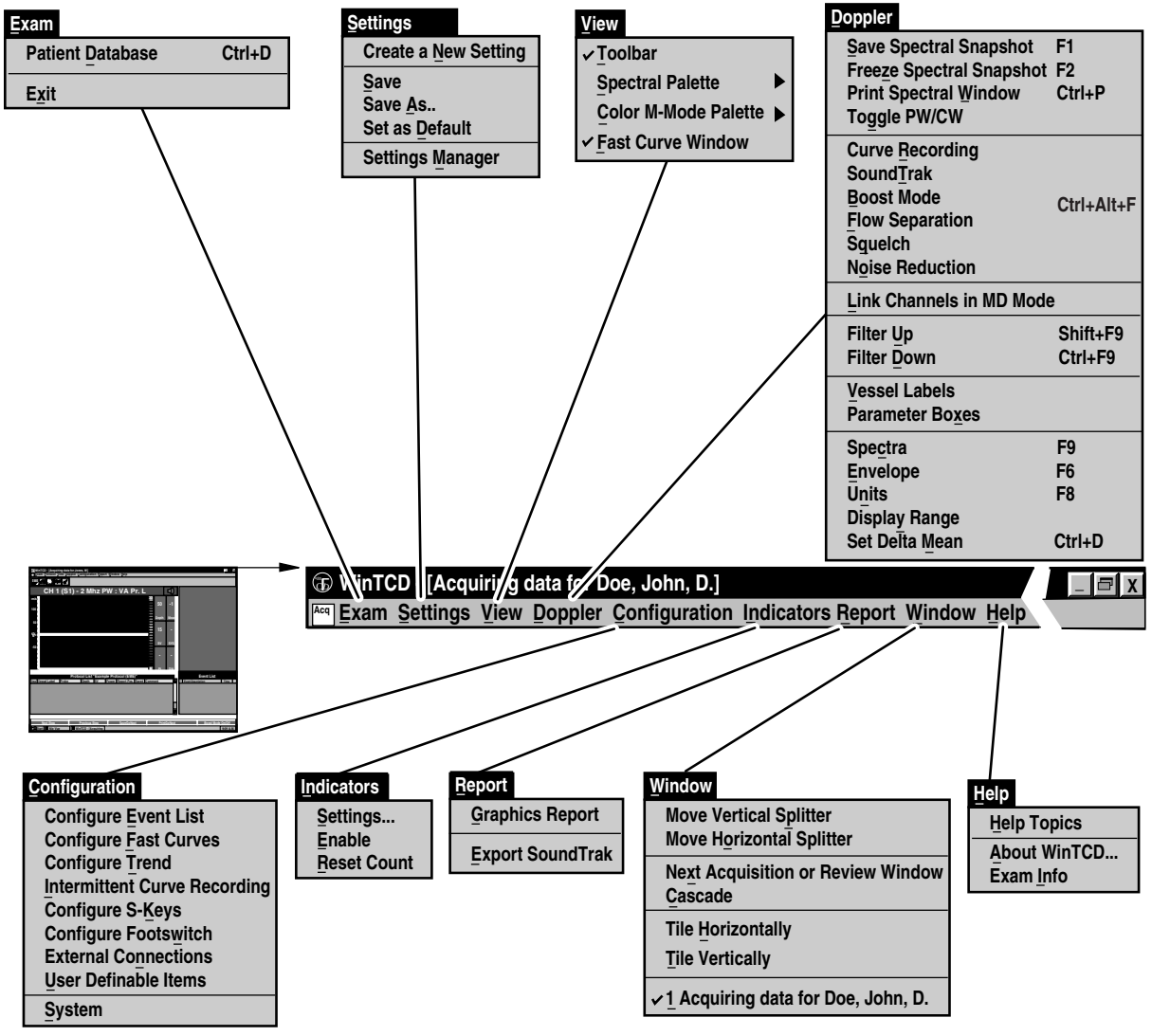
Message Bar
Provides information to the user.

Intensity Scale (dB)
Signal intensity can range from 0 to 64 dBs.

Fast Curve Window
Displays real-time monitoring curves of designated Doppler parameters and/or analog information.

Trend Window
Displays long-term monitoring curves of designated Doppler parameters and/or analog information.

Summary - Monitoring Acquisition Screen Menus



Summary - Diagnostic Review Screen Overview

Probe/Vessel Label
Shows probe mode and the selected vessel label used during the exam.

Patient name

Flow Velocity Scale
(cm/s or kHz)

Doppler Window

Flow Direction Indicator
Red arrow = blood flow toward probe, above the Zero Baseline.
Blue arrow = blood flow away from probe, above the Zero Baseline.
To change flow direction, press the **Direction** key on the Remote Control.

Zero Baseline
Adjust vertical position of the spectral data using the **Zero** key on the Remote Control.

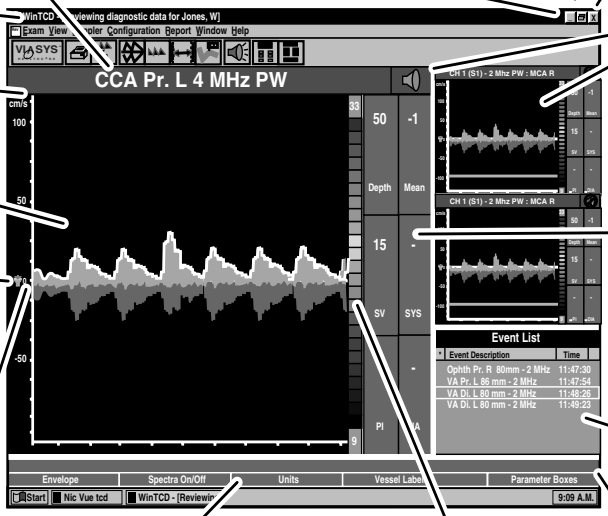
Minimize Button
Reduce WinTCD to an icon on the desktop. Click on the WinTCD icon to return the display.

Window Size Button
Reduce the size of the window. Restore the window to its original size

Exit Window Button
Close the window (Exit the WinTCD program).

Speaker Mute
Click on to mute speaker; shows mute status.

Copy Window
Displays the saved Doppler screens captured when the **Save** key on the Remote Control or F1 on the keyboard is pressed to resave.



Parameter Boxes
Shows the current Doppler parameters. To choose from a menu of 12 options, click the **Right** mouse button anywhere inside this area.

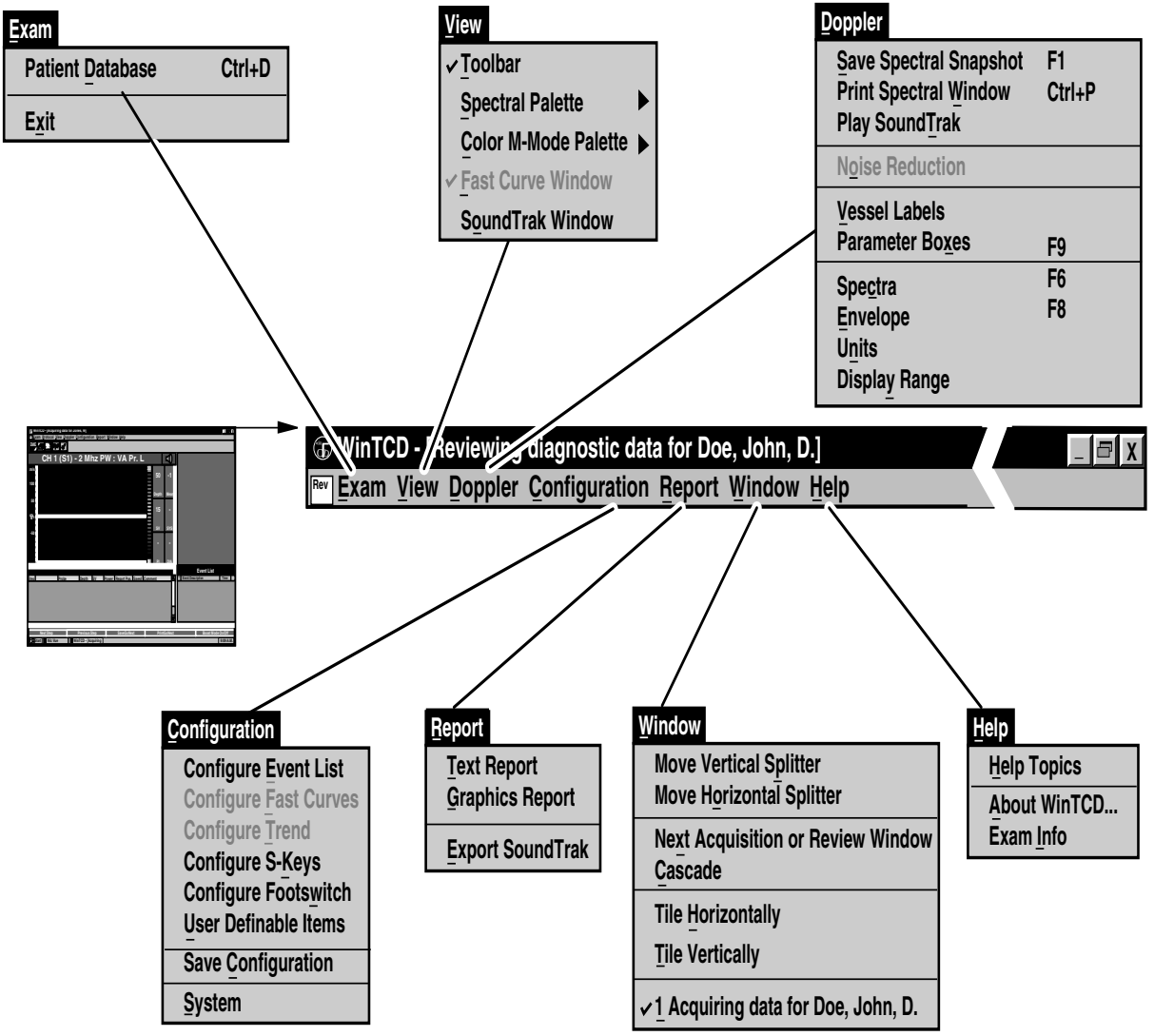
Event List
Lists events (saved records) that occurred during the exam.

Softkey Status Bar
Identifies the function of the softkeys on the remote control. To change softkey functions, click the **Right** mouse button on the softkey to view a menu.

Intensity Scale (dB)
Signal intensity can range from 0 to 64 dBs.

Message Bar
Provides information to the user.

Summary - Diagnostic Review Screen Menus



Summary - Monitoring Review Screen Overview

Save/Channel/Socket/ Probe/Vessel Label
Shows saved record, channel, socket, probe mode and the selected vessel label.

Minimize Button
Reduce WinTCD to an icon on the desktop. Click on the WinTCD icon to return the display.

Window Size Button
Reduce the size of the window. Restore the window to its original size

Exit Window Button
Close the window (Exit the WinTCD program).

Patient name

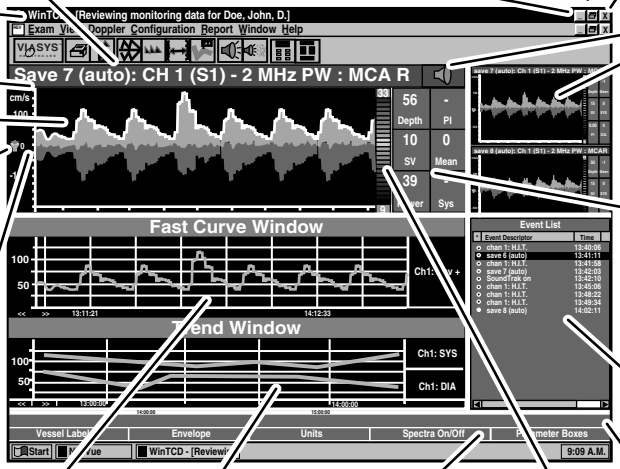
Speaker Mute
Click on to mute speaker; shows mute status.

Flow Velocity Scale
(cm/s or kHz)

Copy Window
Displays the saved Doppler screens captured when the **Save** key on the Remote Control or F1 on the keyboard is pressed to resave.

Doppler Window

Flow Direction Indicator
Red arrow = blood flow toward probe, above the Zero Baseline.
Blue arrow = blood flow away from probe, above the Zero Baseline.
To change flow direction, press the **Direction** key on the Remote Control.



Parameter Boxes
Shows the current Doppler parameters. To choose from a menu of 13 options, click the **Right** mouse button anywhere inside this area.

Event List
Lists events (saved records, etc.) that occurred during the exam.

Zero Baseline
Adjust vertical position of the spectral data using the **Zero** key on the Remote Control.

Softkey Status Bar
Identifies the function of the softkeys on the remote control. To change softkey functions, click the **Right** mouse button on the softkey to view a menu.

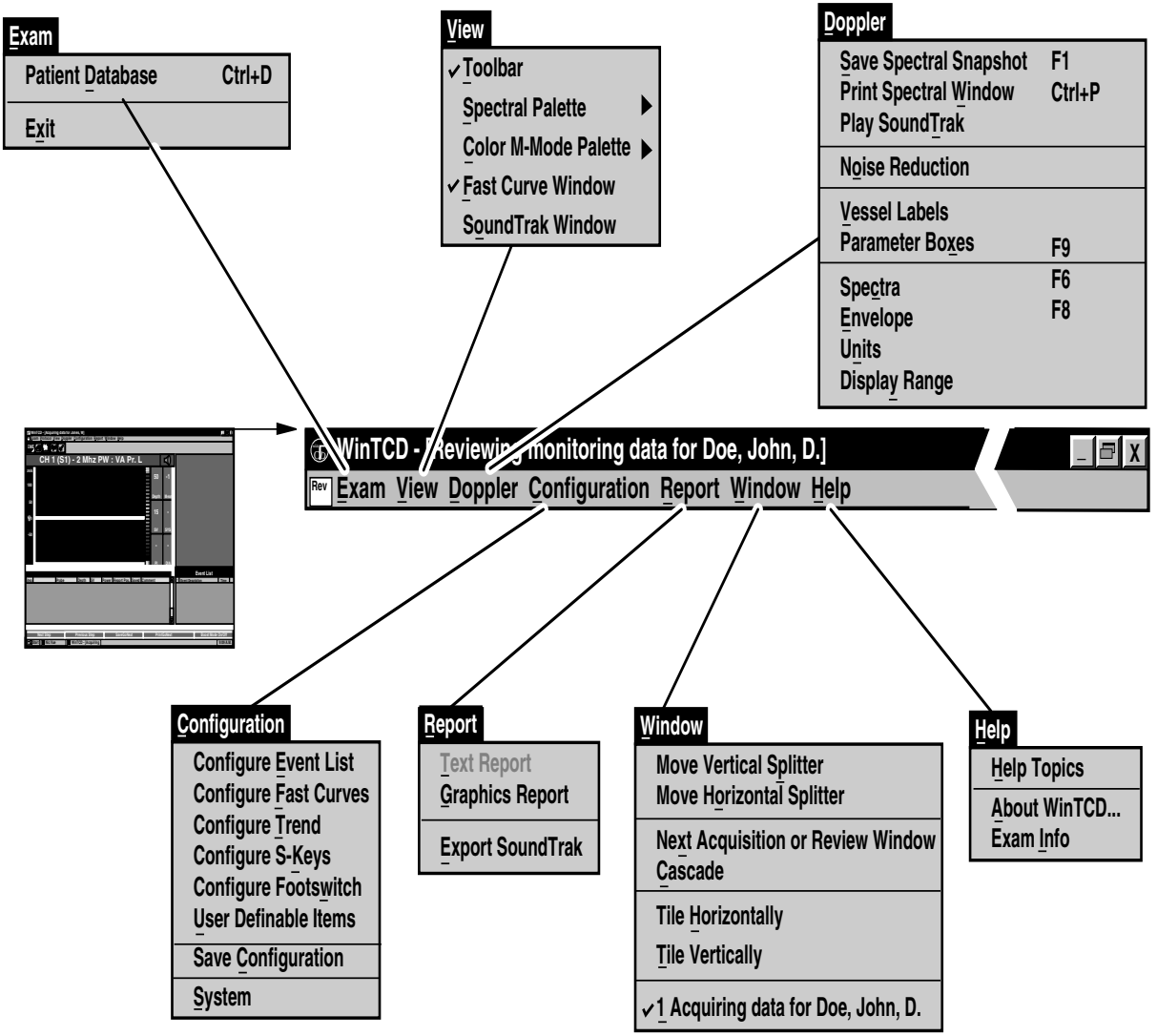
Message Bar
Provides information to the user.

Fast Curve Window
Displays real-time monitoring curves of designated Doppler parameters and/or analog information.

Trend Window
Displays long-term monitoring curves of designated Doppler parameters and/or analog information.

Intensity Scale (dB)
Signal intensity can range from 0 to 64 dBs.

Summary - Monitoring Review Screen Menus



Summary - Diagnostic Acquisition Screen Control Buttons

About Button
Same as the
Help>About WinTCD
menu function. Displays a window with various information about your WinTCD system.

Save Spectral Snapshot
Same as the
Doppler>Save Spectral Snapshot
menu function. Saves the running spectral window to the harddisk.

Previous Step
Same as the
Protocol>Previous Step
menu function.
Jumps to the previous protocol step.

Protocol Manager
Same as the
Protocol>Protocol Manager
menu function. Lets you load, rename or delete an existing protocol, or save a new protocol.

Toggle PW/CW
Same as the
Doppler>Toggle PW/CW
menu function. Toggles the mode of the transducer between PW and CW when possible.

Boost Mode
Same as the
Doppler>Boost Mode
menu function. Toggles the boost mode level.

Noise Reduction
Same as the
Doppler>Noise Reduction
menu function. Toggles the audio noise reduction circuitry.

Set Delta Mean
Same as the
Doppler>Set Delta Mean
menu function. Sets the 100% reference value for the delta mean calculation.

Change Scale Units
Same as the
Doppler>Units
menu function. Toggles the scale units for the spectral display between cm/sec and kHz.

Print Graphics Report
Same as the
Report>Graphics Report
menu function. Opens dialog box to allow the printing of a graphics report.

Save Go Next
Same as the
Protocol>Save Go Next
menu function.
Saves running spectral display and jumps to the next protocol step.

Freeze Spectral Snapshot
Same as the
Doppler>Freeze Spectral Snapshot
menu function. Freezes the running Doppler display in a pop up freeze window.

High Frequency Enhance
Same as the
Doppler>HFE Mode
menu function. Toggles the High Frequency Enhance Mode for the spectral display.

Select a New Probe
Same as the
Doppler>Probe
menu function.
Opens dialog box to allow selection of new transducer.

Show Vessel Label List
Same as the
Doppler>Vessel Labels
menu function. Activates the vessel label menu.

Next Step
Same as the
Protocol>Next Step
menu function.
Jumps to next protocol step.

Switch Displayed Envelopes
Same as the
Doppler>Envelope
menu function. Toggles the envelope curves between above, below, both, and off.

Print Text Report
Same as the
Report>Text Report
menu function. Opens dialog box to allow the printing of a text report.

Summary - Monitoring Acquisition Screen Control Buttons

Print Spectral Window
Same as the ***Doppler>Print Spectral Window*** menu function. Prints out a hard copy of the spectral window.

Save Spectral Snapshot
Same as the ***Doppler>Save Spectral Snapshot*** menu function. Saves the running spectral window to the harddisk.

SoundTrak On/Off
Same as the ***Doppler>SoundTrak*** menu function. Allows audio Doppler data to be stored to the hard disk.

Link Channels in MD Mode
Same as the ***Doppler>Link Channels in MD Mode*** menu function. Links all channels related to each transducer so Doppler adjustments affect all channels.

Noise Reduction
Same as the ***Doppler>Noise Reduction*** menu function. Toggles the audio noise reduction circuitry.

Set Delta Mean
Same as the ***Doppler>Set Delta Mean*** menu function. Sets the 100% reference value for the delta mean calculation.

Show Vessel Label List
Same as the ***Doppler>Vessel Labels*** menu function. Activates the vessel label menu.

Curve Recording On/Off
Same as the ***Doppler>Curve Recording*** menu function. Lets you start and stop curve recordings.

Settings Manager
Same as the ***Settings>Settings Manager*** menu function. Lets you load, rename or delete an existing setting, or save a new setting.

Spectra On/Off
Same as the ***Doppler>Spectra*** menu function. Toggles the display of the spectral data on and off.

Print Graphics Report
Same as the ***Report>Graphics Report*** menu function. Opens dialog box to allow the printing of a graphics report.

Freeze Spectral Snapshot
Same as the ***Doppler>Freeze Spectral Snapshot*** menu function. Freezes the running Doppler display in a pop up freeze window.

Switch Displayed Envelopes
Same as the ***Doppler>Envelope*** menu function. Toggles the envelope curves between above, below, both, and off.

Indicators On/Off
Same as the ***Indicators>Enable*** menu function. Toggles the indicator algorithm on and off.

About Button
Same as the ***Help>About WinTCD*** menu function. Displays a window with various information about your WinTCD system.

Boost Mode
Same as the ***Doppler>Boost Mode*** menu function. Toggles the boost mode level.

Change Scale Units
Same as the ***Doppler>Units*** menu function. Toggles the scale units for the spectral display between cm/sec and kHz.

Summary - Diagnostic Review Screen Control Buttons

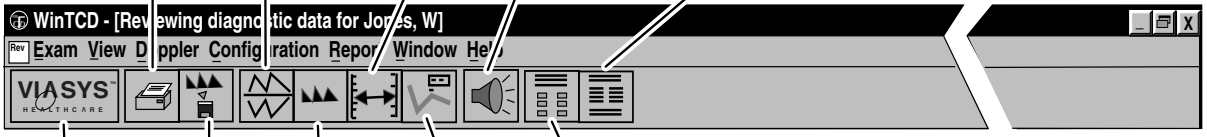
Print Spectral Window
Same as the
Doppler>Print Spectral Window
menu function. Prints out a hard copy of the spectral window.

Change Scale Units
Same as the
Doppler>Units
menu function. Toggles the scale units for the spectral display between cm/sec and kHz.

Switch Displayed Envelopes
Same as the
Doppler>Envelope
menu function. Toggles the envelope curves between above, below, both, and off.

Play SoundTrak
Same as the
Doppler>Play SoundTrak
menu function. Allows audio Doppler data to be played back from the hard disk.

Print Text Report
Same as the
Report>Text Report
menu function. Opens dialog box to allow the printing of a text report.



About Button
Same as the
Help>About WinTCD
menu function.
Displays a window with various information about your WinTCD system.

Spectra On/Off
Same as the
Doppler>Spectra
menu function. Toggles the display of the spectral data on and off.

Print Graphics Report
Same as the
Report>Graphics Report
menu function. Opens dialog box to allow the printing of a graphics report.

Save Spectral Snapshot
Same as the
Doppler>Save Spectral Snapshot
menu function. Saves the active spectral window to the harddisk.

Show Vessel Label List
Same as the
Doppler>Vessel Labels
menu function. Activates the vessel label menu.

Summary - Monitoring Review Screen Control Buttons

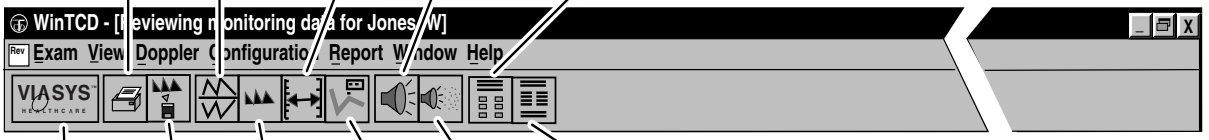
Print Spectral Window
Same as the
Doppler>Print Spectral Window
menu function. Prints out a hard copy of the spectral window.

Change Scale Units
Same as the
Doppler>Units
menu function. Toggles the scale units for the spectral display between cm/sec and kHz.

Switch Displayed Envelopes
Same as the
Doppler>Envelope
menu function. Toggles the envelope curves between above, below, both, and off.

Play SoundTrak
Same as the
Doppler>Play SoundTrak
menu function. Allows audio Doppler data to be played back from the hard disk.

Print Text Report
Same as the
Report>Text Report
menu function. Opens dialog box to allow the printing of a text report. (Not Available)



About Button
Same as the
Help>About WinTCD
menu function.
Displays a window with various information about your WinTCD system.

Save Spectral Snapshot
Same as the
Doppler>Save Spectral Snapshot
menu function. Saves the active spectral window to the harddisk.

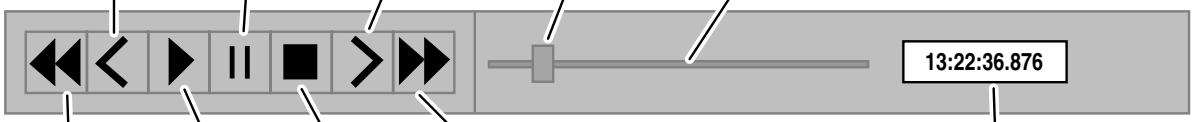
Spectra On/Off
Same as the
Doppler>Spectra
menu function. Toggles the display of the spectral data on and off.

Show Vessel Label List
Same as the
Doppler>Vessel Labels
menu function. Activates the vessel label menu.

Noise Reduction
Same as the
Doppler>Noise Reduction
menu function. Toggles the audio noise reduction circuitry.

Print Graphics Report
Same as the
Report>Graphics Report
menu function. Opens dialog box to allow the printing of a graphics report.

Summary - Continuous SoundTrak Screen Control Buttons



Page Back Button
Decrements the time position in the Continuous SoundTrak file by one spectral sweep.

Page Forward Button
Increments the time position in the Continuous SoundTrak file by one spectral sweep.

Examination Length Indicator
Graphically represents the length of the Continuous SoundTrak file. The left side is the beginning of the file and the right side is the end.

Pause Button
Stops the playback of the Continuous SoundTrak data and places the system in Pause mode.

Position Indicator Tab
Points to the present time position in the Continuous SoundTrak file.

Play Button
Starts the playback of the Continuous SoundTrak data starting at the time shown in indicator at the right side.

Fast Forward Button
Increments the time position in the Continuous SoundTrak file in a fast mode.

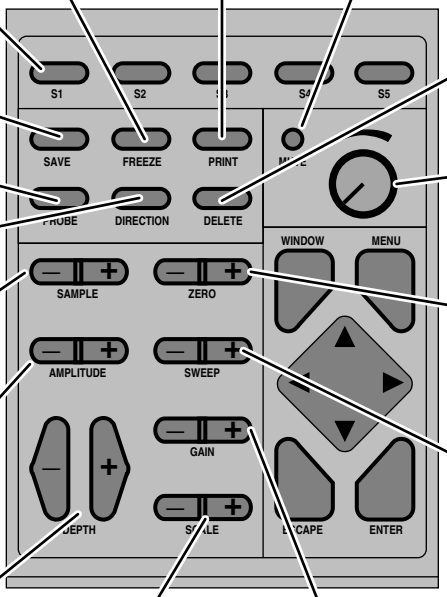
Rewind Button
Decrements the time position in the Continuous SoundTrak file in a fast mode.

Stop Button
Stops the playback of the Continuous SoundTrak data and places the system in Freeze mode.

Time Position Indicator
Displays the current time position in the Continuous SoundTrak file.

Summary - Remote Control Functions

The equivalent keyboard ***hotkeys*** are enclosed with ***{}*** *brackets*.



S1-S5
{Alt 1 - 5}
These keys are user programmable and their functions vary with the current system function and configuration.

Freeze
{F2}
Freezes a spectrum for labeling or online post-processing.

Print
{Ctrl+P}
Prints the highlighted window. Works only for Spectral Windows.

Mute
{F5}
Mutes the audio signal.

Save
{F1}
Saves active spectra to disk.

Probe
Activates different available channels.

Direction
{F4}
Changes the displayed direction of flow in the active Doppler window.

Sample
{ctrl + F6 = decrease -}
{shift + F6 = increase +)
Adjusts the axial length of the sample volume.

Amplitude
{ctrl + F5 = decrease -}
{shift + F5 = increase +}
Adjusts the amplitude (power) setting of the ultrasound signal.

Depth
{ctrl + F1 = decrease -}
{shift + F1 = increase +}
Adjusts the depth of the sample volume.

Scale
{ctrl + F2 = decrease -}
{shift + F2 = increase +}
Adjusts the spectral velocity scale.

Gain
{ctrl + F4 = decrease -}
{shift + F4 = increase +}
Adjusts the gain of the receiver amplifier or offline software gain.

Delete
{Delete}
Deletes the saved spectrum highlighted in the Event List.

Volume Knob
{ctrl + F7 = decrease -}
{shift + F7 = increase +}
Adjusts the volume of the Doppler signal.

Zero
(ctrl + F3 = decrease -}
{shift + F3 = increase +}
Adjusts the zero line position of the spectral display.

Sweep
{ctrl + F8 = decrease -}
{shift + F8 = increase +}
Adjusts the spectral sweep speed.

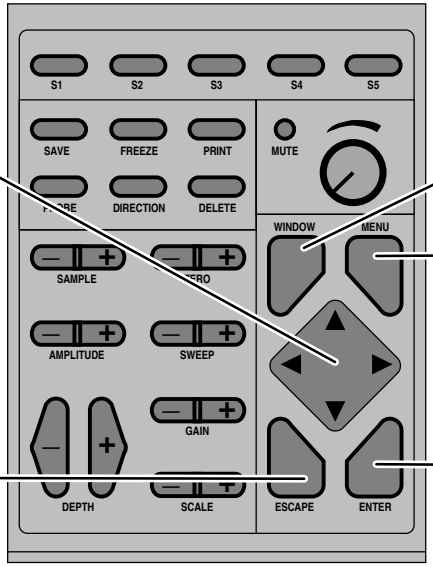
Remote Control Functions Summary continued

Arrow Keys
{Arrow keys on keyboard}
Moves menu highlight bar, selects answers to various system questions, adjusts various settings values, positions cursors, and positions text.

Left/Right arrow key functions
Pages display backward or forward in analog real-time and trend windows, selects menus, and resizes windows.

Up/Down arrow keys functions
Moves the menu cursor up or down a list and resizes windows.

Escape
{Esc key on keyboard}
Cancels the selected task, returns to the previous menus, or answers no to system questions.



Window
{shift + F10}
Switches between display windows.

Menu
Selects the pulldown menus. At this point, you can use the Arrow keys to navigate through the menus and then press the Enter key to make your menu selection.

Enter
{Enter or Return key}
Executes the selected task or answers yes to system questions.

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Chapter S4
Starting WinTCD

Log on to the system **S4-3**

Start the program and open (create) a file **S4-4**
Summary of steps S4-4

This chapter describes how to start the WinTCD software.

Important: If you are not familiar with the Nicolet NicVue software which is used to launch various Nicolet Biomedical Inc. software programs, make sure you have the ***Nicolet NicVue User Guide*** on hand.

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Log on to the system

Each time power is applied to the system, you have to log on to the system. Usually this is an automatic process if the system is not protected by a password. In the case that the system requires a password, please refer to the instructions on this page to help you log on to the system.

These instructions have been written for the Windows 2000 operating system but the Windows XP operating system is very similar.

1. After the system finishes booting up, the **Begin Logon** prompt appears (Figure 1).

2. If required, simultaneously press the **Ctrl**, **Alt**, and **Delete** keys (Figure 2) and then release the keys.

3. After a short wait, the Logon Information window appears (Figure 3).

Note: If no password is required, the system may bypass the log on procedure or if the log on window appears, simply click on OK to continue and go to the next page. If a password is necessary, continue with step 4.

***** Default Password is either **scimed** or **Nicolet** for the administrator user.

4. If necessary, type your name, password***** (case sensitive - i.e., you must type your password exactly in the same upper/lower case letters as when the password was created. For example, if the password is **Mary**, neither of the following entries will be accepted: **MARY** or **mary** because they do not have matching upper/lower case letters). Also, if presented, choose the domain in which your account is located. If you need additional information, click on the **Help** button (Figure 1).

5. Click on OK.

6. After a short wait, the Desktop screen display appears.

7. Go to the next page.

Figure 1: A window similar to this will appear while the systems boots. When this prompt appears, press and hold down the Ctrl, Alt, and Delete keys (see Figure 2) and then release them.

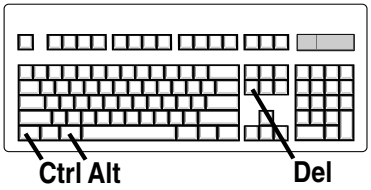

Figure 2: Press and hold down all three keys (Ctrl, Alt, and Delete) and then release the keys.

Figure 3: Enter the required information and then click on OK. This illustration may vary accordingly for your networking configuration.

Start the program and open (create) a file

The WinTCD program must have been installed on your system before the program can be started. If you ordered your system from the factory, it has already been installed for your use.

A summary of steps for the Nicolet NicVue is included on this page. If you need help, please refer to the ***NicVue User Guide*** that accompanied this guide for instructions on starting the WinTCD application and for opening (or creating a new) patient record.

Note: Depending on the version of NicVue, which is installed on the system, the icons may vary. For older systems, the icons should be displayed as shown below in Figure 4.

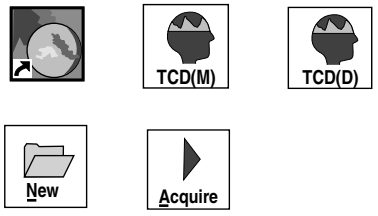

Figure 4: Older NicVue Icons.

Summary of steps

1. From the Desktop and using the Left mouse button, double-click on the **NicVue icon**.

2. You now must create a new patient record by clicking on the **New** button or clicking on the desired patient record listed on the NicVue window.

3. From the NicVue window, click on the **TCD(M)** button for **monitoring** or click on the **TCD(D)** button for **diagnostic**.

4. Click on the **Acquire** button.

5. After a several seconds the window and panel in Figure 1 appear. Either click on **Dismiss** or wait for the system to exit and display either Figure 2 or 3 automatically.

Go to ....

6. If you selected **TCD(M)** in step 3, go to *Chapter S5* when an Acquisition window similar to Figure 2 appears.

   If you selected **TCD(D)** in step 3, go to *Chapter S6* when an Acquisition window similar to Figure 3 appears.

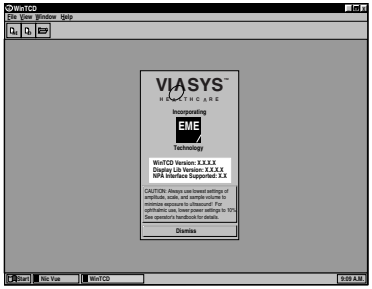

Figure 1: This window will appear followed by the panel after several seconds. You can click on the Dismiss button or wait for a few seconds after which the system will go to the chosen acquisition window automatically.

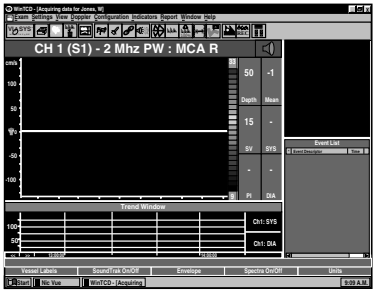

Figure 2: Example Monitoring acquisition window.

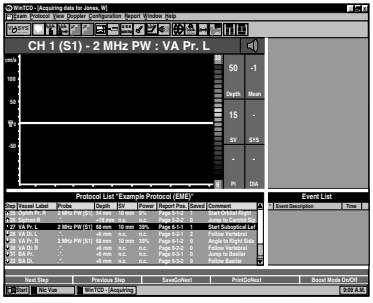

Figure 3: Example Diagnostic acquisition window.

Chapter S5
Preparing the System for Monitoring

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This chapter describes how to set up the basic screen displays for Monitoring acquisitions. For Diagnostic acquisition preparations, see the next Chapter.

For more detailed information concerning the creation of new custom settings files which take advantage of audio inputs and outputs, Continuous SoundTrak, MDD Mode, and FFT resolution issues, refer to sections S9, S16, and S17 in this manual.

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Choose the monitoring mode settings

When switching into the monitoring acquire mode, the system automatically loads a default setting. If the default Settings file is not the file you wish to use during the examination, perform either of the following procedures to select a different Settings file.

Note: If the current Settings file is the one you want to use, skip this procedure.

To Create a New Settings file, create a New Default Settings file, Delete a Settings file, or Rename a Settings file, see *Chapter S9* in this guide.

Note: The Settings files contain many parameters. This chapter describes the various configurable features - all of which are saved in the Settings files.

Note: Figure 3 will appear with four columns on a Pioneer TC8080 system and two columns on a Companion III system since the columns correspond to the number of probe sockets.

Method 1

1. Click on the **Settings Manager** button.
2. Click on the **file** you want to use and then click on **Load** (Figure 1).

Note: The current Settings file is identified with an **Arrow** prefix. The **Diamond** prefix is the current default.

Method 2

1. Click on the **Settings** menu (Figure 2).
2. Select the **Settings Manager** menu point.
3. Click on the **file** you want to use and then click on **Load** (Figure 1).

Note: Figure 3 will not appear if the transducers are connected correctly to the system. If incorrect connections were made, make the corrections as necessary and then click on **Load**.

You can choose to override the system and click on the **Manual assignment** checkbox and then make your selections from this panel. The number of channels must however remain the same.

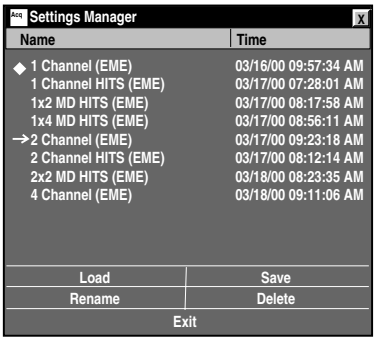


Figure 1: Click on the Settings file you want to load and then click on Load.

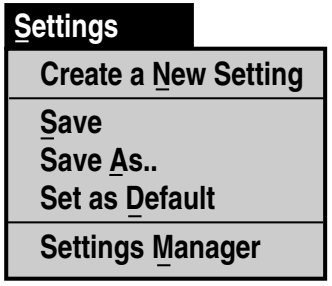


Figure 2: Click on the Settings menu and then on the Settings Manager menu point.

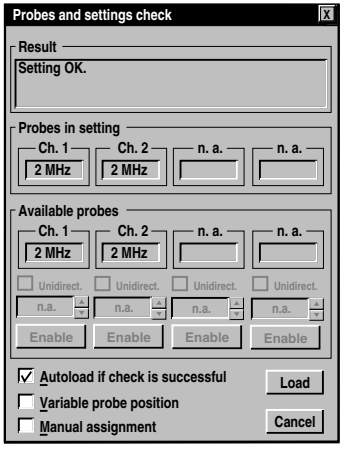


Figure 3: This panel does not appear if the probes are connected correctly to the system (Pioneer TC8080 example).

Set the screen display

Use the following procedures to choose how you want the Doppler information presented on the screen display.

- Set the Remote Control S1 - S5 key functions.
- Set the Footswitch functions.
- Set the Flow Velocity scale.
- Choose the Flow Direction.
- Choose the Doppler Parameter Boxes display.
- Set the Copy window.
- Customize the sizes of the Doppler window, Trend window, Event window, and Copy Window using the mouse and Splitter-bars. See ***Customizing the Window Sizes*** later in this chapter for information.
- If displaying the Trend window, choose the Trend data you want to view.
- Configure the Event List window.
- If you want to use indicator algorithm, you can select the default settings.
- Choose whether you want to display the Doppler in color or gray.
- Choose which Vessel Labels are selected.

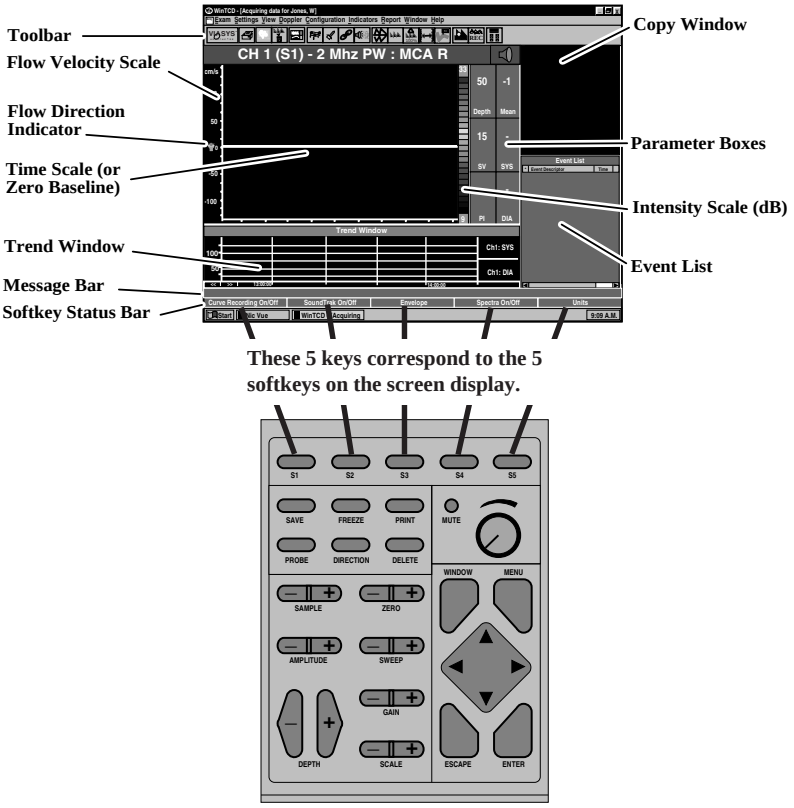


Figure 1: Set up the basic screen display to meet your preferences and needs.

Note: Refer to chapter S17 in this handbook for information on configuring the fast curve window.

Set the Remote Control S1 - S5 key functions

You can select, from a menu of options, the functions of the five keys (S1 - S5) on the Remote Control (Figure 1). These five keys allow you to quickly execute the chosen function by simply pressing the corresponding key (S1 - S5) on the Remote Control or by clicking on the displayed softkey.

Example
If, for example, the S1 key is currently assigned to the Vessel Labels function and you want to change it to *Units*, use the Right mouse key and click on the *Vessel Labels* softkey and then click on *Units* from the options menu. The first softkey (S1) will now read *Units* and pressing the **S1** key on the Remote Control will alternate the Flow Velocity Scale between **cm/s** and **kHz**.

1. Position the mouse pointer over the **softkey** displayed towards the bottom of the Acquisition window (Figure 2).

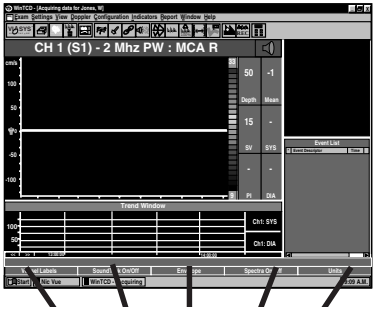
2. Click the **Right** mouse button.

3. Click on the function you want to assign to the selected softkey (Figure 3).

4. Repeat until all five S-keys have been assigned a specific function.

Note: Alternatively the S-keys can be configured by selecting the function Configure S-keys out of the Configuration menu. In the pop up dialog box a set of S-keys can be defined for each of the three operation windows (main window, freeze window, and review window). See next page.

Note: You can not assign the same function to multiple S-keys with the mouse. If you want to reassign a function, you must first remove the function from the current key.



These 5 keys correspond to the 5 softkeys on the screen display.

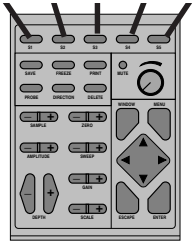


Figure 1: The softkeys displayed on the screen can be clicked on to execute the action or the corresponding S-key on the remote control can be pressed to execute the action.

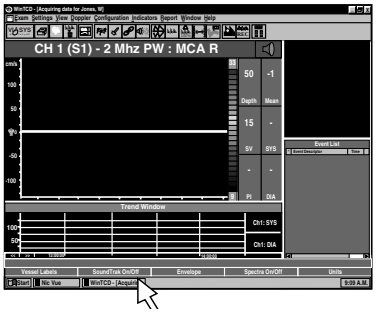


Figure 2: Position the mouse pointer over the displayed softkey you want to define and then click the Right mouse button.

- Indicators On/Off
- Envelope
- Filter Down
- Filter Up
- Toggle PW/CW
- SoundTrak On/Off
- Spectra On/Off
- Units
- Vessel Labels
- Graphics Report
- Parameter Boxes
- Indicators Settings
- Indicators Reset Count
- Curve Recording On/Off
- Settings Manager
- Boost Mode
- Squelch On/Off
- Flow Separation On/Off
- Export SoundTrak
- Multi Depths Link On/Off
- MD Expand Depths
- MD Contract Depths
- Inc. Rx Pulse Width
- Dec. Rx Pulse Width
- M-Mode Display Options
- Display Range
- Inc. Tx Pulse Width
- Dec. Tx Pulse Width
- Tx/Rx Linkage On/Off
- Calculate VMR (H-Cursors)
- Calculate VMR (A-Cursors)
- Audio Playback Scale Set
- Set Delta Mean
- S-Markers
- I-Markers
- Noise Reduction
- Fast Curve Window

Figure 3: Click on the function you want to assign to the selected key. (List shown is an example from the monitoring mode)

Set the footswitch functions

The three footswitch keys on the Footswitch can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window).

1. Select the Configure Footswitch function out of the Configuration menu. The Footswitch Configuration menu (Figure 1) will appear.

2. Click the **Left** mouse button on one of the three tabs to choose the window type.

3. Click the **Left** mouse button on the selection arrow to the right of the function to change and choose the new function from the list of possible functions.

4. Repeat until all nine footswitch functions have been assigned a specific function and click the mouse on the **OK** button to finish.

Note: The remote control S-keys can be configured by selecting the function Configure S-keys out of the Configuration menu. In the pop up dialog box (Figure 2) a set of S-keys can be defined for each of the three operation windows (main window, freeze window, and review window).

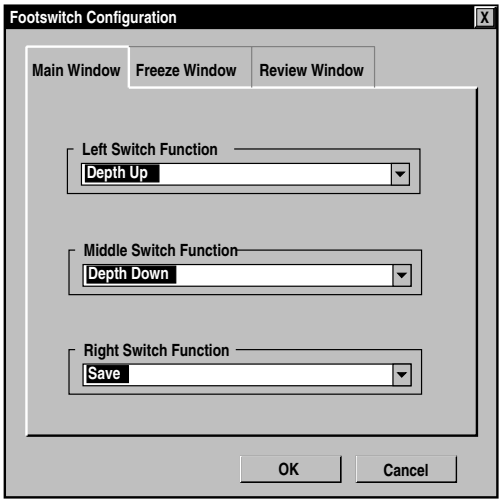


Figure 1: The three footswitch keys on the Footswitch can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window).

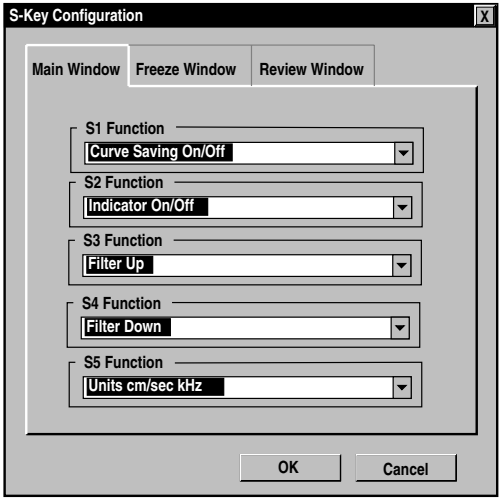


Figure 2: The five remote control S-keys can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window) in a similar way to the footswitch.

Choose the Vessel Labels

You can label the Doppler window(s) with the corresponding vessel label which then will remain permanently with the spectral display.

Method 1

1. Click on **Doppler** (Figure 1).
2. Click on **Vessel Labels**.
3. Click on the desired **Vessel Label** (Figure 3).

Method 2

1. If a softkey is labeled **Vessel Labels**, click on that **softkey** (Figure 2) or press the corresponding **S-key** on the remote control.
2. Click on the desired **Vessel Label** (Figure 3).

Method 3

1. Click on the **Show Vessel Label List** button.
2. Click on the desired **Vessel Label** (Figure 3).

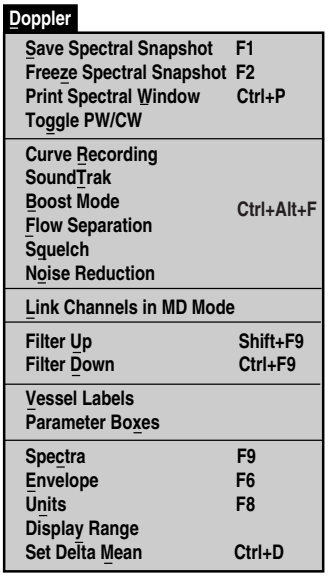


Figure 1: Click on Doppler and then on Vessel Labels.

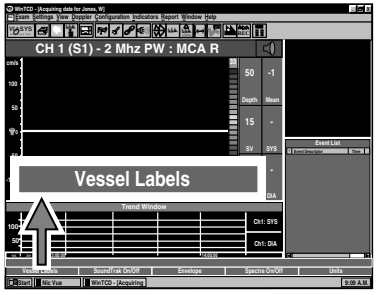


Figure 2: If, for example, the S1 key is labeled Vessel Label, you can either click on the Vessel labels key or press the S1 Key on the remote control.

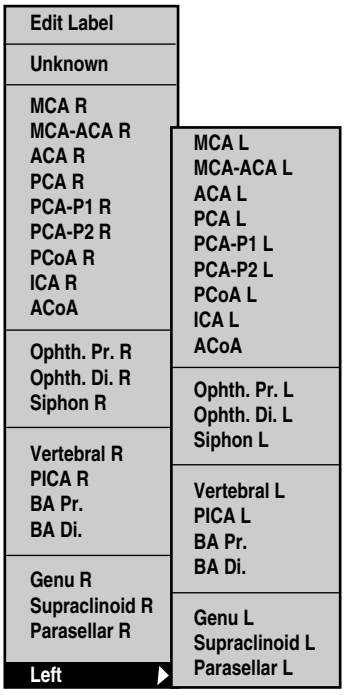


Figure 3: Vessel Labels.

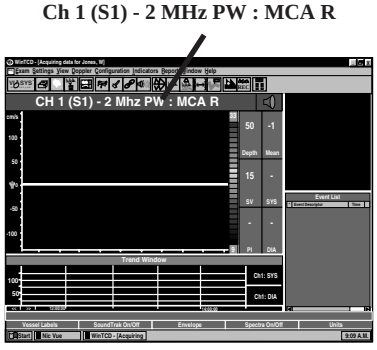


Figure 4: The selected vessel label appears on the screen.

Customizing the window sizes

You can resize the various windows on the screen display by using the mouse and the Splitter-Bars. This allows you to increase the display area of a particular window to enhance your ability to inspect it's contents.

1. Click on and hold down the mouse button on the **Splitter-Bar**.

2. Drag the mouse until the desired window size is reached and then release the mouse button.

Figure 3 shows the Splitter-Bars which can be used to resize the various windows.

Also see the next page for additional methods which can be used to resize the windows.

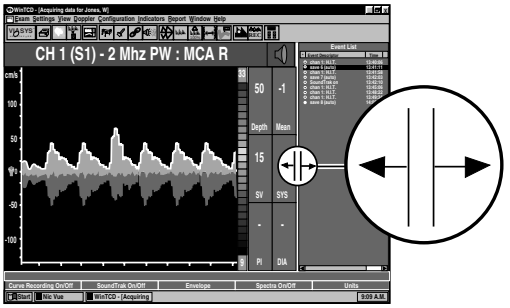


Figure 1: Click and hold down the Left mouse button on the Splitter-Bar and then drag the mouse to left or right to resize the window.

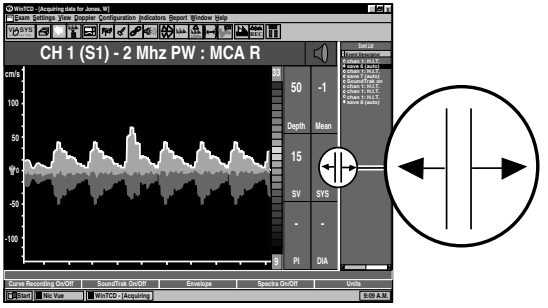


Figure 2: After enlarging the window, the Spectral data is more easily inspected.

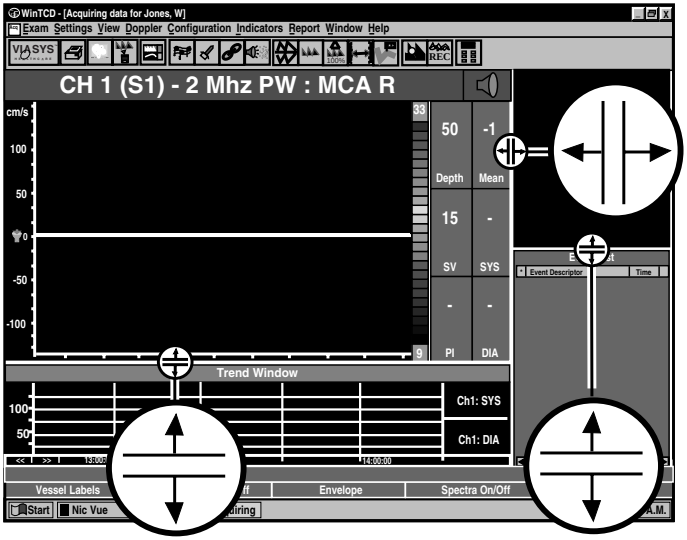


Figure 3: This example shows some of the various Splitter-Bars which can be used to resize specific windows.

Splitting the windows horizontally

1. Either (a) click anywhere in the **Trend window** or (b) press the **Window button** on the Remote Control until the Trend window is in focus (title bar highlighted in blue), next click on **Window** and then on **Move Horizontal Splitter** (Figure 3).

2. Either (a) drag the mouse until the focused window is sized as desired and then click the mouse button or (b) press the **Up/Down Arrow** buttons on either the Remote Control or keyboard and then press the **Enter** button when finished.

Splitting the windows vertically

1. Click on **Window** and then on **Move Vertical Splitter** (Figure 3).

2. Either (a) drag the mouse until the windows are sized as desired and then click the mouse button or (b) press the **Left/Right Arrow** buttons on either the Remote Control or keyboard and then press the **Enter** button when finished.

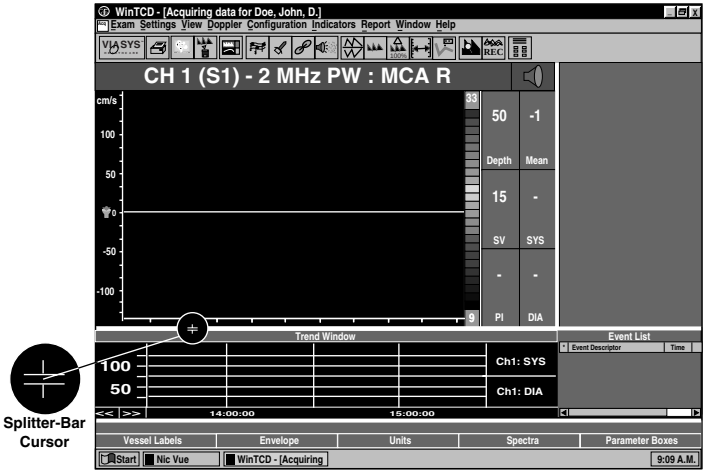


Figure 1: Example screen display before resizing the Trend.

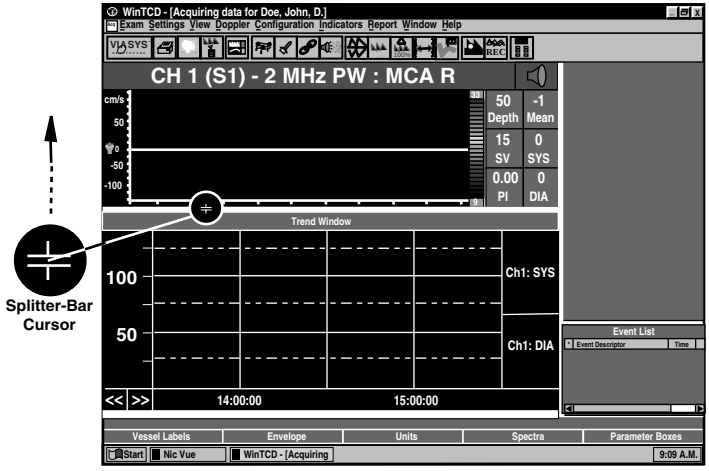


Figure 2: Example screen display after the Trend was enlarged.

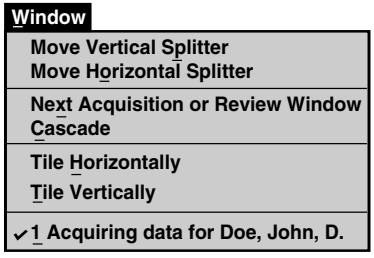


Figure 3: Click on Window and then on Move Horizontal Splitter.

Choose the Doppler Parameter Box display

You can choose to view up to 14 Doppler Parameter Boxes (Figure 1) which show you current parameter values as the test is conducted on your subject.

The available parameters are:

- Depth
- Sample Volume (SV)
- Gain
- Mean Velocity (Mean)
- Systolic (Sys)
- Diastolic (Dia)
- Pulsatility Index (PI)
- Resistance Index (RI)
- H.I.T.S.
- Amplitude (Ampl)
- Power
- Filter
- TIC/TIS
- Delta Mean (D-Mean)

Note: The above parameters are described on the following pages.

1. Position the mouse pointer inside the **Doppler Parameter Box** area and then click the **Right** mouse button (Figure 2).

2. Click on the **Doppler Parameter** (Figure 3) you want to view (or remove from the display) and then click the **Left** or **Right** mouse button. A **checkmark** means that Doppler parameter is currently being displayed.

3. Repeat steps 1 and 2 as necessary.

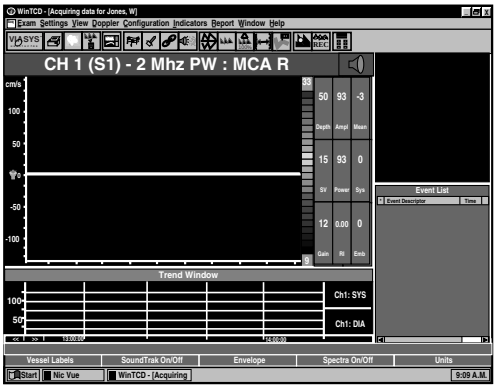


Figure 1: This figure illustrates an example screen with nine Doppler Boxes selected for display.

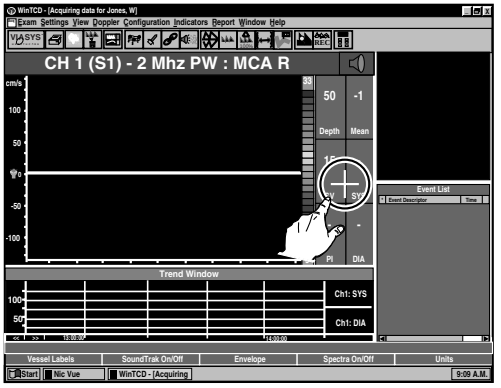


Figure 2: Position the mouse pointer (it will change to a crosshair +) anywhere inside the Doppler Parameter Box area and then click the Right mouse button.

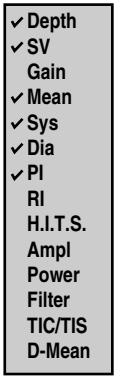


Figure 3: Using the mouse, highlight the parameter you want to add to (or remove from) the Doppler Parameter Boxes and then click either the Left or Right mouse button.

Depth

The Depth Parameter Box shows the distance (in millimeters) of the axial center sample volume from the face of the transducer.

SV (Sample Volume Length)

The SV Parameter Box shows the sample volume which is the axial length of the area from which the Doppler signals are obtained. The larger the sample volume, the longer the duration of the pulse bursts, and consequently the higher the ultrasound output power. See Technical Description of the Sample Volume in Chapter S7.

Gain

The Gain Parameter Box shows the amplification of the received Doppler signal (HW gain).

Filter

The Filter box shows the current high pass filter cutoff frequency in Hz.

Ampl (Amplitude)

The Ampl Parameter Box shows the current amplitude as a percentage of the maximum system output of the ultrasound signal.

Power

The Power box shows the current ultrasound output as a percentage of maximum.

TIC/TIS

Depending on which type of transducer is active, the TIC/TIS box will display either the TIC or TIS index automatically. These indexes are used to provide information to clinical operators at the time of the patient examination such that ultrasound exposure to the patient may be reasonably minimized.

The TIC box displays the current **Cranial Bone Thermal Index.** This Index, which is based on a model where the bone is located close to the surface of the skin, is displayed for the 1.6 MHz and 2 MHz transcranial transducers.

The TIS box displays the current **Soft Tissue Thermal Index**. This Index, which is based on a model where the ultrasound travels through soft tissue only, is displayed for the 4 MHz and 8 MHz extracranial transducers as well as the 16 Mhz and 20 MHz microvascular transducers.

Note: The higher the TIC or TIS value, the greater the tissue warming will be. Adjustments of the **Sample**, **Amplitude**, and the **Scale** parameters will cause the thermal index numbers to change.

Note: Refer to Chapter H1 for more information concerning this index.

Note: The TIC/TIS box is always displayed on systems in the USA and cannot be configured OFF in the acquire mode.

Mean (Mean Velocity)

The Mean Parameter Box shows the Mean velocity of the Doppler spectra. The Mean velocity is a calculation of the average curve measured over the complete sweep of the envelope.

Sys (Systolic)

The Sys Parameter Box shows the peak Systolic flow which is the highest velocity in the spectral display as measured by the envelope. See **Note 1**.

Dia (Diastolic)

The Dia Parameter Box shows the end Diastolic flow which is the lowest velocity in the spectral display as measured by the envelope. See **Note 1**.

PI (Pulsatility Index)

The PI Parameter Box shows the **Gosling's Pulsatility Index** which is a measure of pulsatility. It is calculated as follows:

P.I. = Psys - Edia / Mean

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

See **Note 1**.

RI (Resistance Index)

The RI Parameter Box (Pourcelot Resistance Index) shows a second measurement of pulsatility. It is calculated as follows:

R.I. = Psys - Edia / Psys

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

See N**ote 1**.

H.I.T.S.

The H.I.T.S. Parameter Box shows the current number of HITS - **High Intensity Transient Signals** that have been detected during the test.

D-Mean (Delta Mean)

The D-Mean Parameter Box shows the Delta Mean velocity of the Doppler spectra. The Delta Mean velocity is a similar calculation to the standard Mean Velocity but this box is displayed as a percent of a standard value. By using the Set Delta Mean function, the 100% level for the Delta Mean box is taken from the present Mean value. After this time, the Delta Mean parameter box will display a percent value relative to this level which essentially displays the change in the mean velocity with respect to the point in time where the Set Delta Mean was used.

Note 1: Signal Calculations
The measurements described on this page are made every cardiac cycle. Each signal calculation is made from the envelope of the Doppler signal. The Mean velocity is derived from the envelope and is updated every second, independent of the cardiac cycle. For all calculations, the parameters related to blood flow toward the probe are displayed as positive values, and those related to blood flow away from the probe are displayed as negative values regardless of the **Direction** setting.

Display the Toolbar

You can choose to display (Figure 1) or not display (Figure 2) the Toolbar which provides another way to execute commands to the system. Most users will display the Toolbar.

Turning the Toolbar off provides more space for the display windows.

1. Click on **View** (Figure 3).

2. Click on **Toolbar**. A check mark = Enabled.

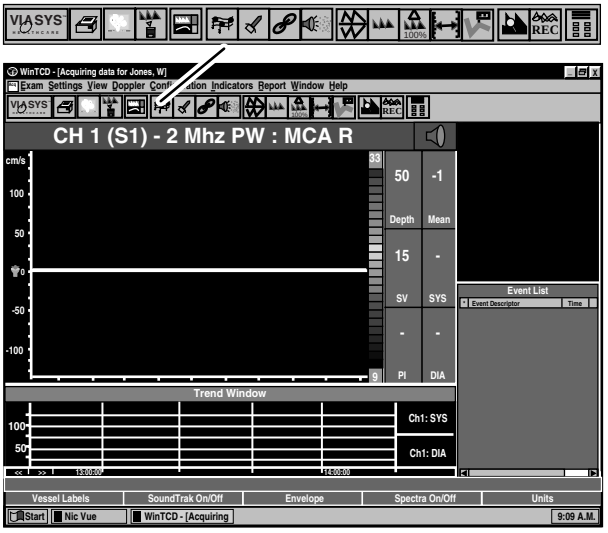


Figure 1: Example display with Toolbar turned on.

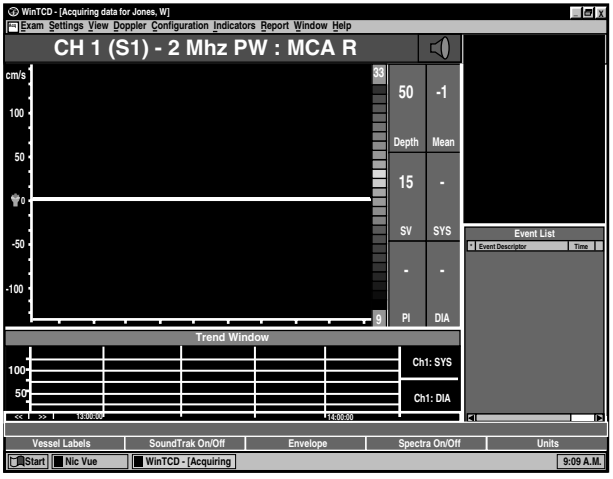


Figure 2: Example display with Toolbar turned off.

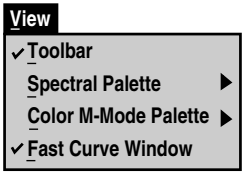


Figure 3: Click on View and then on Toolbar. A check mark = Enabled.

Set the Copy Window

The Copy window (Figure 1) displays saved Spectral Snapshots. It holds the last 20 saved spectral display records and can be scrolled forwards and backwards to view them.

Note: The Copy window is always displayed on the screen unless the Spectral window is increased to its maximum width or the Event List is increased to its maximum height.

Set the Event List window

The Event List window (Figure 2) is used to log the types of events for which you want the system to monitor. All of the events are saved, the configuration just filters what you will view on the screen display.

Note: The Event List window is always displayed on the screen unless the Trend window is increased to its maximum width or the Copy window is increase to its maximum height.

1. **Right** click anywhere inside the **Event List window** (Figure 2).

2. Click on the **Configure Event List** button (Figure 3).

3. Click on the **events** you want logged into the Event List window (Figure 4).
   - Mode Change
   - Doppler Settings
   - Save Events
   - H.I.T.S.
   - User Defined Events

Note: Alternatively the event list can be configured by selecting the function Configure Event List out of the Configuration menu.

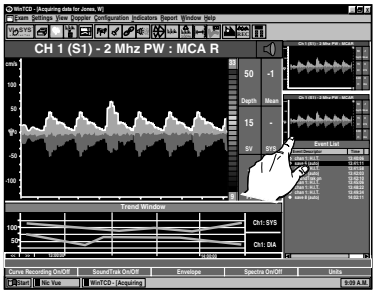


Figure 1: Screen display with saved spectral snapshots in the Copy window.

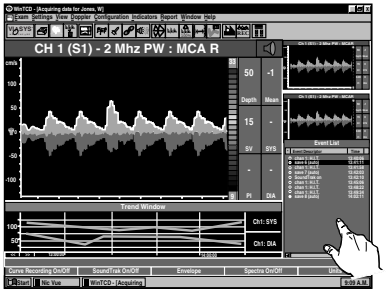


Figure 2: Right click anywhere inside the Event List window.

Figure 3: Click on the Configure event list button.

Figure 4: Make your choices by clicking on (checkmarking) the desired option(s).

Configure the User Defined Event Marker Lists

There are two types of user defined event markers which are supported in the WinTCD software package. The first type of marker is intended for single events (S-Markers). These events are one shot markers which describe events that only happen at one moment in time. The second type of marker is intended for interval events (I-Markers). These events are start / stop type markers which describe events that happen over an interval of time.

Before the S-Markers or I-Markers can be used, they must be preconfigured with the User Definable Items configuration dialog.

The two markers lists can be configured using the procedure on this page.

Note: The event markers lists are used for all examinations and cannot be configured differently for different user defined settings.

Method 1

1. Click on **Configuration** (Figure 1).

2. Click on **User Definable Items** (Figure 1).

3. Click on either **S-Event Markers** or **I-Event Markers** (Figures 2 and 3).

4. Click on the **Add** button to add a new marker name to the bottom of the list. The User Defined Marker dialog (Figure 4) will pop up allowing a new marker name and/or state to be entered. Type in a new name and for the I-Markers, select the state and then press OK.

5. In order to insert a marker, click on a line in the list and then select the **Insert** function to insert a new marker below the selected line.

6. In order to edit a marker, click on the line in the list and then select the **Edit** function.

7. In order to delete a marker, click on the line in the list and then select the **Remove** function.

8. In order to move a marker up or down, click on the line in the list and then select either **Move Up** or **Move Down**.

9. When the list(s) is finished, press OK to save the changes.

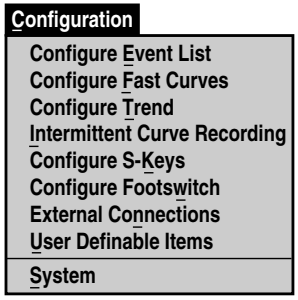


Figure 1: Click on Configuration and then on User Definable Items.

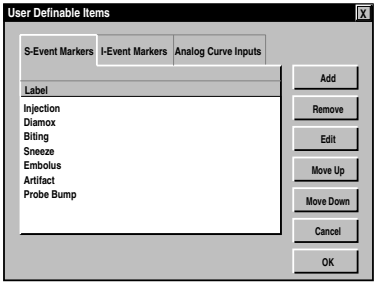


Figure 2: S-Event Marker List.

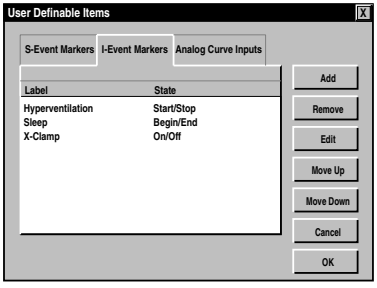


Figure 3: I-Event Marker List.

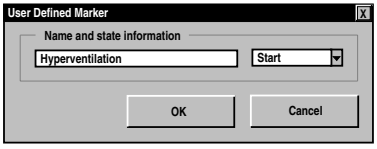


Figure 4: User Defined Marker.

Set the Trend window

The Trend window (Figure 1) is used to display the long-term monitoring curves of user-selected Doppler parameters information.

Note: The Trend window is always displayed on the screen unless the Spectral window is increased to its maximum height or the Event list is increased to its maximum width.

See ***Reviewing the Trend Data*** in *Chapter S8*.

Continue with the next page.

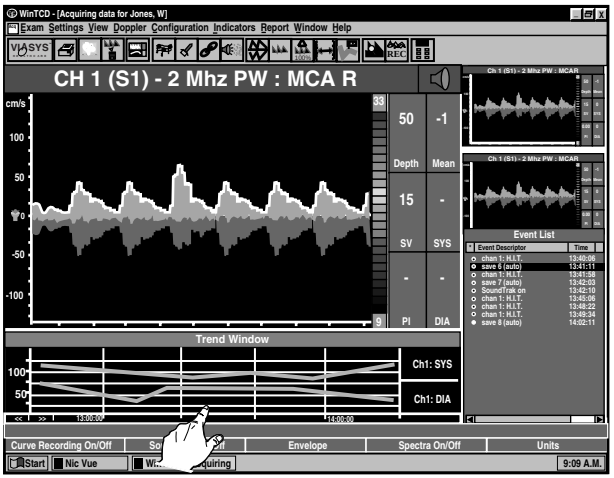


Figure 1: Screen display with the Trend Window.

Note: At the far right side of the title bar in the trend display, a real time file size indicator has been added (Figure 2) so users are always informed of their file size. Refer to section S17 in this manual for more information on Keeping Track of File Size during monitoring examinations.

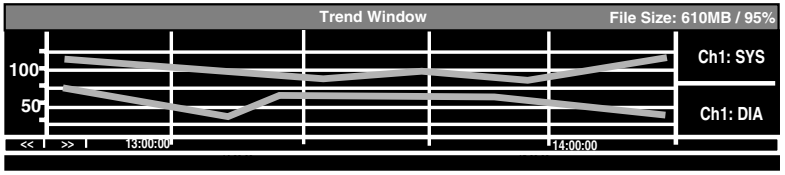


Figure 2: Trend Display with Current File Size Indicator.

Choose the Trend window curves

You can choose to have the Trend window display the long-term monitoring curves of designated Doppler parameters (Figure 1).

The Trend window (Figure 1) can display up to 11 trend curves per channel specified via the Configure Trend panel (Figure 2).

When the trend curves reach the right side of the Trend window, they are shifted towards the left edge of the window.

"Tick" marks appear when events occur and when Doppler parameters are changed during the examination.

You can choose any combination of the six choices for display (flowing toward or away from the transducer).

- **Systole**
- **Diastole**
- **Mean**
- **PI** (Pulsatility Index)
- **RI** (Resistance Index)
- **H.I.T.S.**

Each choice can be assigned one of eight possible colors. Likewise, you can set the minimum and maximum Y-axis scales with which the selected trend curves will be displayed as well as choose which types of events you want displayed. Curves with the same scale limits will share the same scale in the trend, otherwise they will have their own separate scale.

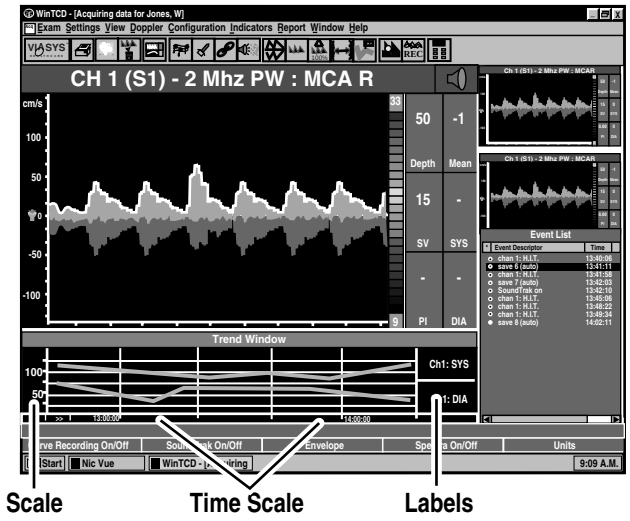


Figure 1: The Trend window can display up to 11 trend curves per channel. This example shows two trend curves (SYS and DIA) have been selected.

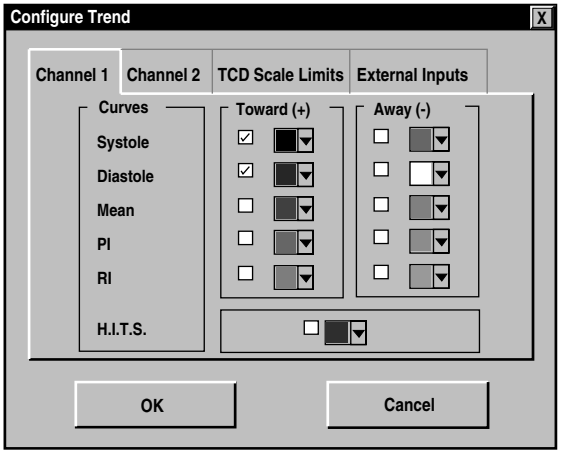


Figure 2: Example Trend Configuration window showing the Systolic and Diastolic Doppler parameters for channel 1 have been selected (checked) for display.

Systole

The peak systolic flow is the highest velocity in the spectral display as measured by the envelope and is displayed in the Doppler window as **SYS**.

Diastole

The end diastolic flow is the lowest velocity in the spectral display as measured by the envelope and is displayed in the Doppler window as **DIA**.

Mean

The Mean velocity of the Doppler spectra is a calculation of the average display envelope and is displayed in the Doppler window as **Mean**.

PI (Pulsatility Index)

Gosling's Pulsatility Index (P.I.) is a measure of pulsatility and is display in the Doppler window as **PI**. It is calculated as follows:

P.I. = Psys - Edia / Mean

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

RI (Resistance Index)

The Pourcelot Resistance Index is a second measure of pulsatility and is displayed in the Doppler window as **RI**. It is calculated as follows:

R.I. = Psys = Edia / Psys

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

H.I.T.S.

The H.I.T.S. counter shows the occurrences of High Intensity Transient Signals and is displayed in the Doppler window labeled **H.I.T.S.**

Method 1

1. Click on **Configuration** (Figure 1).

2. Click on **Configure Trend**.

3. Click on **Curve Configuration**.

4. Go to the next page.

Method 2

1. Position the mouse pointer (it will change to a crosshair) inside the Trend window (Figure 2) and then click the **Right** mouse button.

2 Click on **Curve Configuration** (Figure 3).

3. Go to the next page.

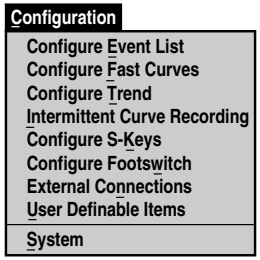


Figure 1: Click on Configuration.

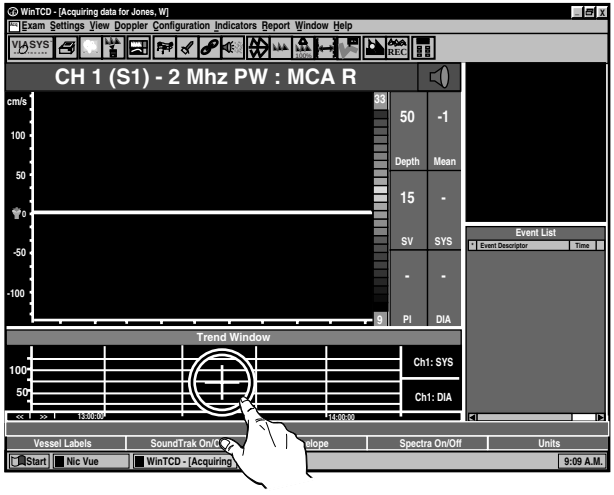


Figure 2: Right click inside the Trend window.

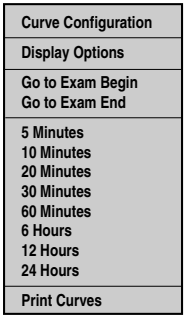


Figure 3: Click on Curve Configuration.

Choose the Trend curves for display and curve colors

1. Choose the trend curve you want displayed by clicking on (checkmark) its associated **check box** and then choose with which **color** you want the curve displayed (Figure 1). Click on the next **Channel # tab** and repeat as necessary.

Set the Trend curves scales

2. Click on the **TCD Scale Limits** tab and set the **Minimum** and **Maximum** Y-scale ranges (Figure 2).

Choose the external inputs to be displayed

3. Click on the **External Inputs** Configuration tab (if available on the system) and then checkmark the curves to be displayed, their colors, and their scale limits (Figure 3).

4. When finished making your selections, click on **OK.**

Note: Refer to section S17 in this manual for more information on using and configuring the external inputs for display in the fast curves window.

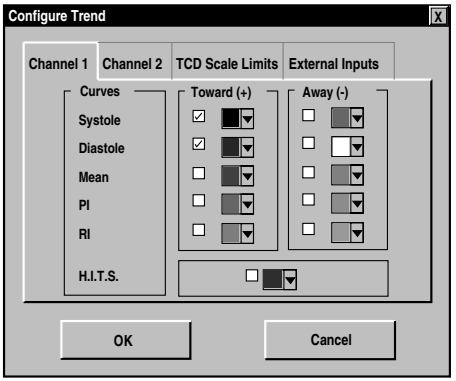


Figure 1: Click on (checkmark) each of the trend curves checkboxes you want displayed and then click on the Show Menu arrow button and choose which color you want each curve displayed.

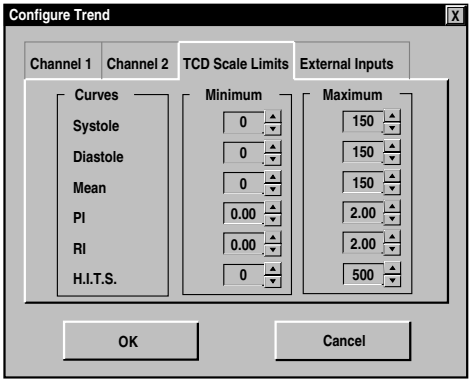


Figure 2: Click on the Up/Down Arrow buttons to choose the desired Minimum and Maximum scale ranges with which you want each curve displayed.

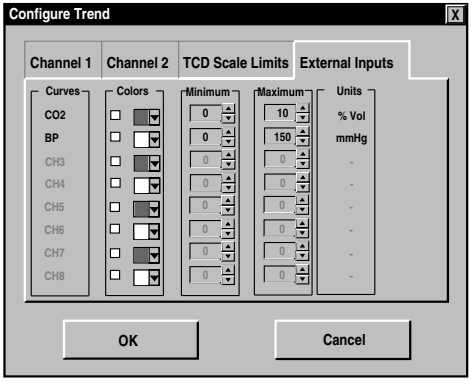


Figure 3: Click on (checkmark) each of the external inputs you want displayed and then click on OK.

Set the Trend display options

1. Click on the **Display Options** menu point in the Trend configuration menu (Figure 1) and the Display Trend Options dialog will appear (Figure 2).

Choose which events will be displayed

2. Click on the events you want displayed in the Trend window (Figure 2).
   - Mode Change
   - Doppler Settings
   - Save Events
   - H.I.T.S.
   - User Defined Events

Event types which are not checked will just be displayed as a tick at the top of the display with no text.

Toggle scale sharing

3. Check the **Scale Sharing** function to toggle the scale sharing on. This will allow more than one trend curve to be displayed in the same scale section of the trend. Leave the box unchecked to force each trend curve to have its own scale section in the trend.

Toggle background grid

4. Check the **Show Background Grid** function to toggle the background grid for the trend on and off. Leave the box unchecked to hide the grid.

5. When finished making your selections, click on **OK.**

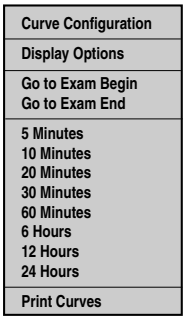


Figure 1: Click on Display Options.

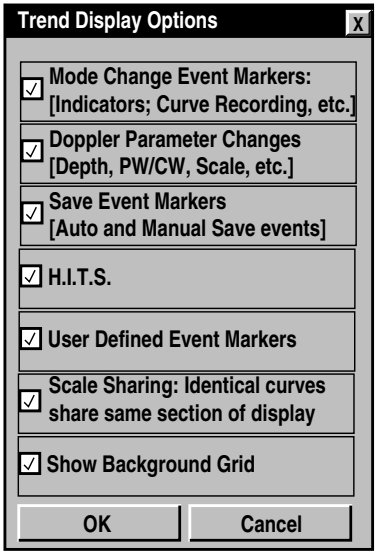

Trend Display Options
X
Mode Change Event Markers: [Indicators; Curve Recording, etc.]
Doppler Parameter Changes [Depth, PW/CW, Scale, etc.]
Save Event Markers [Auto and Manual Save events]
H.I.T.S.
User Defined Event Markers
Scale Sharing: Identical curves share same section of display
Show Background Grid
OK
Cancel

Figure 2: Make your choices by clicking on (checkmarking) the desired option(s).

Set the Doppler color

You can choose to view the displayed Doppler spectrum either in color or grayscale.

1. Click on **View** (Figure 1).

2. Click on **Spectral Palette**.

3. Click on either **Color, Grayscale**, or on **Color Mode 2** as desired (Figure 2).

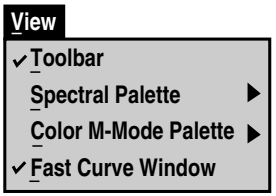


Figure 1: Click on View and then on Spectral Palette.

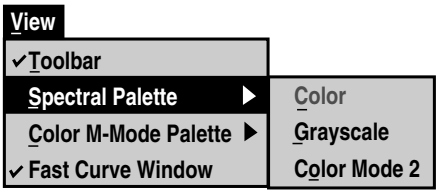


Figure 2: Click on Color, Grayscale, or on Color Mode 2 as desired. The current selection will appear grayed on the menu.

Chapter S6
Preparing the System for Diagnostics

Choose the diagnostic mode protocol **S6-3**
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Sys (Systolic) S6-13
Dia (Diastolic) S6-13
PI (Pulsatility Index) S6-13
RI (Resistance Index) S6-13
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Choose the Doppler colors **S6-14**
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Continued on the next page.

This chapter describes how to setup the basic screen displays for Diagnostic acquisitions. For Monitoring preparations, please return to the previous chapter.

Also included in this chapter are instructions for saving parameter setting changes permanently with the active step in the protocol.

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Power column S6-19
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Saved column S6-19
Comment column S6-19
Cursor bar S6-19
Active Step indicator S6-19

Saving Doppler/DSP changes to the active Protocol step **S6-20**

Choose the diagnostic mode protocol

The system parameters can be set up quickly for diagnostics by selecting a previously created protocol file.

If you want to create your own protocol, see *Chapter S10* in this guide.

Use either of the following methods to choose a protocol.

Method 1

1. Click on the **Protocol Manager** button.
2. Click on the **desired file**, click on **Load** (Figure 1).
3. If Figure 2 appears, insert the correct transducers and then click on **Load.**

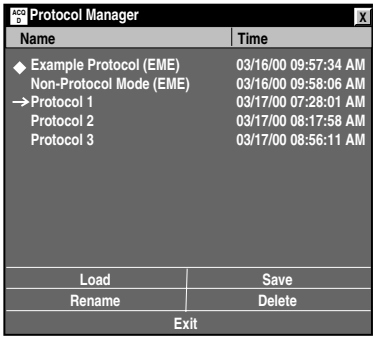


Figure 1: Click on the Protocol file you want to load and then click on Load.

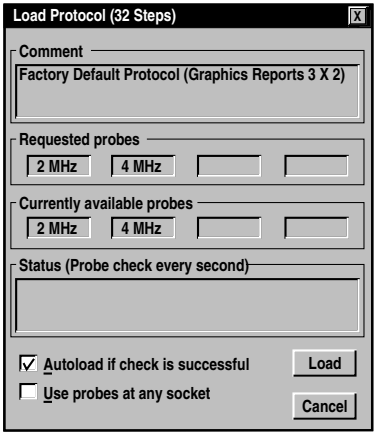


Figure 2: If this panel appears, insert the correct transducers and click on Load.

Method 2

1. Click on the **Protocol** menu (Figure 3).
2. Click on **Protocol Manager**.
3. Click on the **desired file**, click on **Load** (Figure 1).
4. If Figure 2 appears, insert the correct transducers and then click on **Load.**

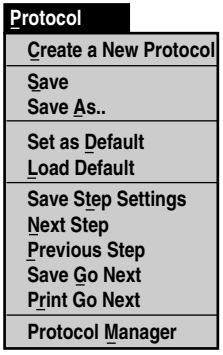


Figure 3: Click on the Protocol menu and then click on Protocol Manager.

Diag. Only Activate the transducer(s)

To manually activate the transducer(s) when multiple transducers are connected to the system, use either of the following methods.

Method 1

1. Press the **Probe** key (Figure 1).

Method 2

1. Click on the **Doppler** menu and then on **Probe** (Figure 2).

Method 3

1. Click on the **Probe** button.

For each method, continue by clicking on the desired transducer's **Socket #** button (Figure 3).

The currently selected transducer appears above the Doppler window (Figure 4).

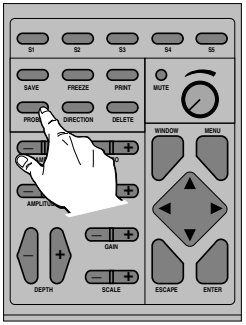


Figure 1: Press the Probe key.

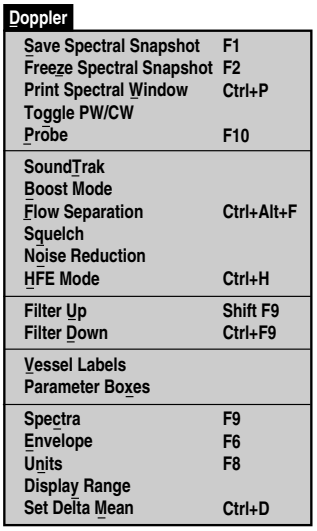


Figure 2: Click on Doppler and then on Probe.

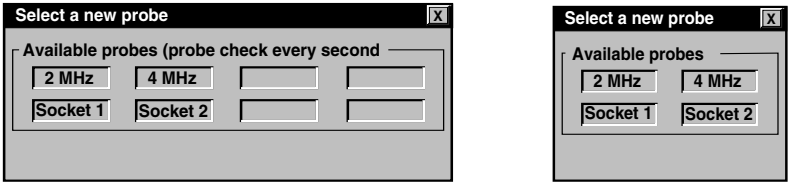


Figure 3: Click on the Socket # button associated with the transducer you want to use (Pioneer TC8080 and Companion III examples).

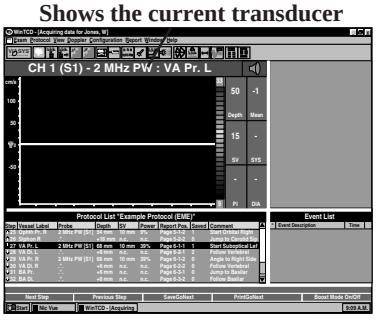


Figure 4: The currently selected transducer is identified towards the top of the window.

Note: This is not the preferred method of activating the transducers. The efficient way is to preconfigure the various transducers in a protocol file and then select the probes by loading steps out of the protocol list. The Probe key should be used only when defining a protocol or whenever something out of the ordinary occurs.

Set the screen display

Use the following procedures to choose how you want the Doppler information presented on the screen display. Instructions are located on the following pages.

- Set the Remote Control S1 - S5 key functions
- Set the Footswitch functions
- Set the Flow Velocity Scale
- Choose the Flow Direction
- Choose the Doppler Parameter Boxes display
- Customize the sizes of the Doppler window, Protocol List window, Event window, and Copy Window using the mouse and Splitter-bars. See ***Customizing the Window Sizes*** later in this chapter for information.
- Choose whether you want to display the Doppler in color or grayscale.

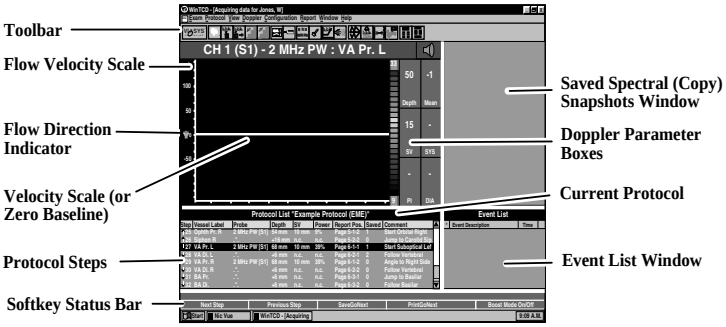


Figure 1: Set up the basic screen display to meet your preferences and needs.

Set the Remote Control S1 - S5 key functions

You can select, from a menu of options, the functions of the five keys (S1 - S5) on the Remote Control (Figure 1). These five keys allow you to quickly execute the chosen function by simply pressing the corresponding key (S1 - S5) on the Remote Control or by clicking on the displayed softkey.

Example
If, for example, the S1 key is currently assigned to the Vessel Labels function and you want to change it to *Units*, use the Right mouse key and click on the *Vessel Labels* softkey and then click on *Units* from the options menu. The first softkey (S1) will now read *Units* and pressing the **S1** key on the Remote Control will alternate the Flow Velocity Scale between **cm/s** and **kHz**.

1. Position the mouse pointer over the **softkey** displayed towards the bottom of the Acquisition window (Figure 2).

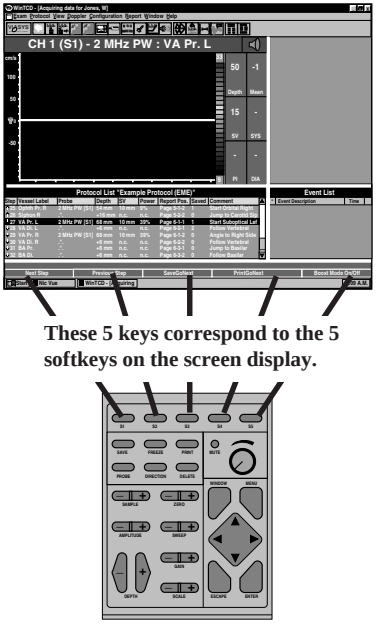
2. Click the **Right** mouse button.

3. Click on the function you want to assign to the selected softkey (Figure 3).

4. Repeat until all five S-keys have been assigned a specific function.

Note: Alternatively the S-keys can be configured by selecting the function Configure S-keys out of the Configuration menu. In the pop up dialog box a set of S-keys can be defined for each of the three operation windows (main window, freeze window, and review window). See next page.

Note: You can not assign the same function to multiple S-keys with the mouse. If you want to reassign a function, you must first remove the function from the current key.



These 5 keys correspond to the 5 softkeys on the screen display.

Figure 1: The softkeys displayed on the screen can be clicked on to execute the action or the corresponding S-key on the remote control can be pressed to execute the action.

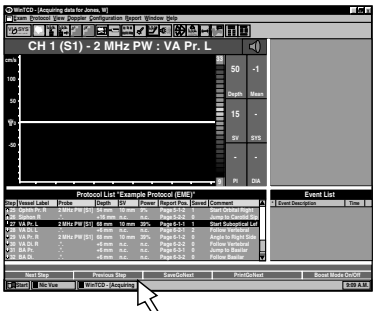


Figure 2: Position the mouse pointer over the displayed softkey you want to define and then click the Right mouse button.

- Envelope
- Filter Down
- Filter Up
- Toggle PW/CW
- SoundTrak On/Off
- Spectra On/Off
- Units
- Vessel Labels
- Next Step
- Previous Step
- SaveGoNext
- PrintGoNext
- Save Step Settings
- Text Report
- Graphics Report
- Parameter Boxes
- Protocol Manager
- Boost Mode
- Squelch On/Off
- Flow Separation On/Off
- Export SoundTrak
- Inc. Rx Pulse Width
- Dec. Rx Pulse Width
- Display Range
- Inc. Tx Pulse Width
- Dec. Tx Pulse Width
- Tx/Rx Linkage On/Off
- Set Delta Mean
- HFE Mode On/Off
- HFE Breakpoint
- Noise Reduction

Figure 3: Click on the function you want to assign to the selected key. (List shown is an example from the diagnostic mode)

Set the footswitch functions

The three footswitch keys on the Footswitch can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window).

1. Select the Configure Footswitch function out of the Configuration menu. The Footswitch Configuration menu (Figure 1) will appear.

2. Click the **Left** mouse button on one of the three tabs to choose the window type.

3. Click the **Left** mouse button on the selection arrow to the right of the function to change and choose the new function from the list of possible functions.

4. Repeat until all nine footswitch functions have been assigned a specific function and click the mouse on the **OK** button to finish.

Note: The remote control S-keys can be configured by selecting the function Configure S-keys out of the Configuration menu. In the pop up dialog box (Figure 2) a set of S-keys can be defined for each of the three operation windows (main window, freeze window, and review window).

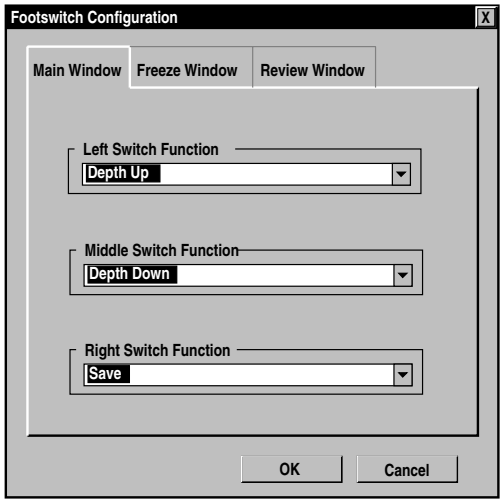


Figure 1: The three footswitch keys on the Footswitch can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window).

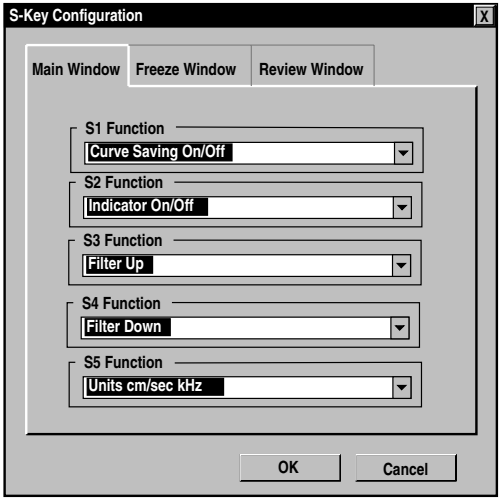


Figure 2: The five remote control S-keys can be configured for the three different types of display windows (Main Window, Freeze Window, and Review Window) in a similar way to the footswitch.

Customizing the window sizes

You can resize the various windows on the screen display by moving the Splitter-Bars. This lets you increase the display area of a particular window to enhance your ability to inspect it's contents.

For example, Figure 2 shows the effect of resizing the Spectral window in Figure 1.

1. Click on and hold down the mouse button on the **Splitter-Bar**.

2. Drag the mouse until the desired window size is reached and then release the mouse button.

Figure 3 shows the Splitter-Bars that can be used to resize the various windows.

Also see the next page for additional methods which can be used to resize the windows.

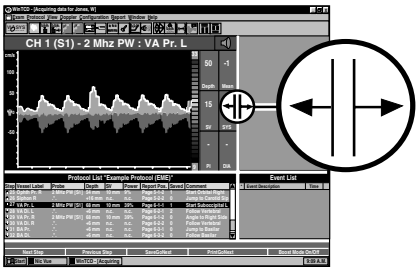


Figure 1: Click and hold down the Left mouse button on the Splitter-Bar and then drag the mouse to left or right to resize the window.

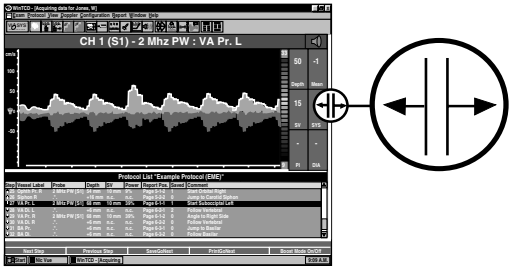


Figure 2: After enlarging the window, the Spectral data is more easily inspected.

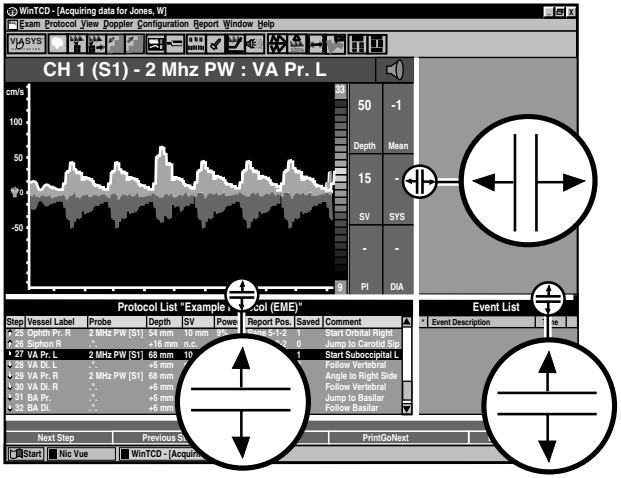


Figure 3: This example shows the various Splitter-Bars which can be used to resize specific windows.

Splitting the windows horizontally

1. Either (a) click anywhere in the **Protocol List (or Event List) window** or (b) press the **Window button** on the Remote Control until the Protocol List (or Event List) window is in focus (title bar highlighted in blue), next click on **Window** and then on **Move Horizontal Splitter** (Figure 3).

2. Either (a) drag the mouse until the focused window is sized as desired and then click the mouse button or (b) press the **Up/Down Arrow** buttons on either the Remote Control or keyboard and then press the **Enter** button when finished.

Splitting the windows vertically

1. Click on **Window** and then on **Move Vertical Splitter** (Figure 3).

2. Either (a) drag the mouse until the windows are sized as desired and then click the mouse button or (b) press the **Left/Right Arrow** buttons on either the Remote Control or keyboard and then press the **Enter** button when finished.

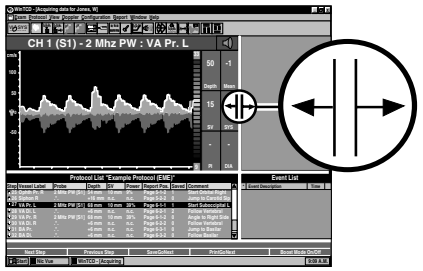


Figure 1: Click and hold down the Left mouse button on the Splitter-Bar and then drag the mouse to left or right to resize the window.

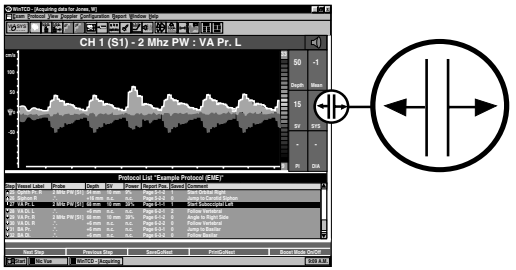


Figure 2: After enlarging the window, the Spectral data is easier to inspect.

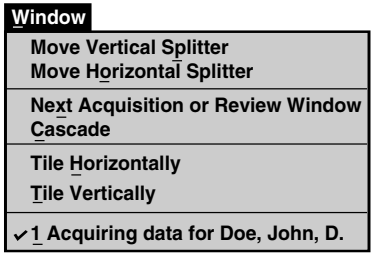


Figure 3: Click on Window and then on Move Horizontal Splitter or Move Vertical Splitter.

Choose the Vessel Labels

You can label the Doppler window with the corresponding vessel label which then will remain permanently with the spectral display.

Method 1

1. Click on **Doppler** (Figure 1).
2. Click on **Vessel Labels**.
3. Click on the desired **Vessel Label** (Figure 3).

Method 2

1. If a softkey is labeled **Vessel Labels**, click on that **softkey** (Figure 2) or press the corresponding **S-key** on the remote control.
2. Click on the desired **Vessel Label** (Figure 3).

Method 3

1. Click on the **Show Vessel Labels List** button.
2. Click on the desired **Vessel Label** (Figure 3).

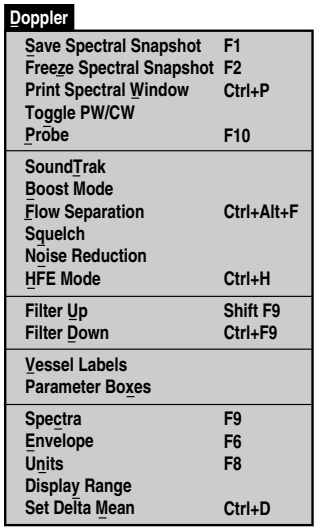


Figure 1: Click on Doppler and then on Vessel Labels.

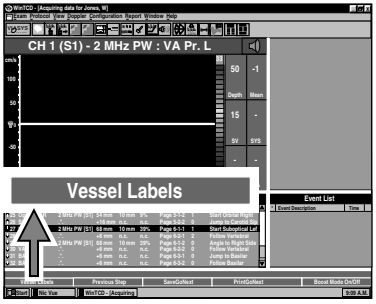


Figure 2: If, for example, the S1 key is labeled Vessel Labels, you can either click on the Vessel labels key or press the S1 Key on the remote control.

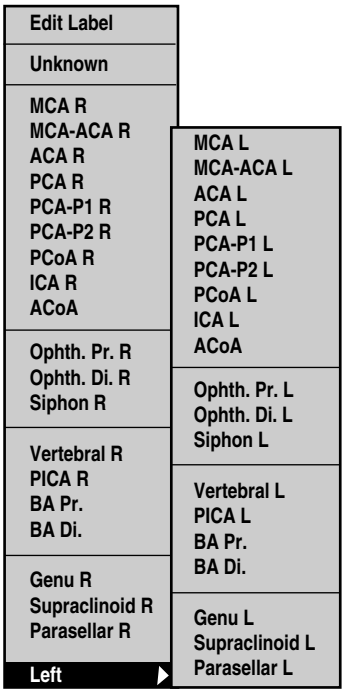


Figure 3: Vessel Labels.

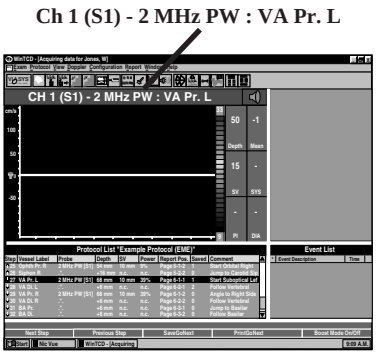


Figure 4: The selected vessel label appears on the screen.

Choose the Doppler Parameter Box display

You can choose to view up to 13 Doppler Parameter Boxes (Figure 3) which show you current parameter values as the test is conducted on your subject.

You can choose to view up to 13 of the following parameter values:

- Depth
- Sample Volume (SV)
- Gain
- Mean Velocity (Mean)
- Systolic (Sys)
- Diastolic (Dia)
- Pulsatility Index (PI)
- Resistance Index (RI)
- Amplitude (Ampl)
- Power
- Filter
- TIC/TIS
- Delta Mean (D-Mean)

Note: The above parameters are described on the following pages.

1. Position the mouse pointer inside the Doppler Parameter Box area and then click the **Right** mouse button (Figure 2).

2. Click on the **Doppler** Parameter Box you want to view (or remove from the display) and then click the **Left** or **Right** mouse button. A **checkmark** means that Doppler parameter is currently being displayed.

3. Repeat steps 1 and 2 as necessary.

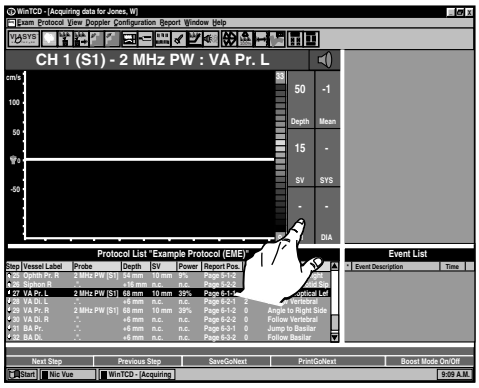


Figure 1: This figure illustrates an example screen with six Doppler Parameter Boxes selected for display.

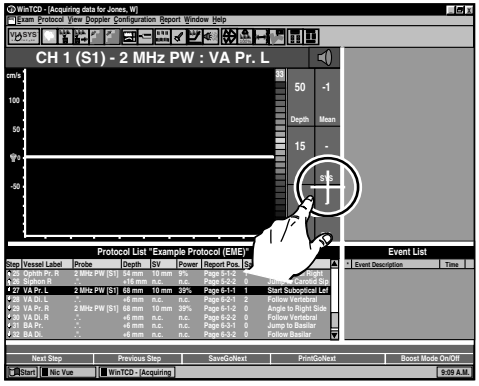


Figure 2: Position the mouse pointer (it will change to a crosshair +) anywhere inside the Doppler Parameter Box area and then click the Right mouse button.

Figure 3: Using the mouse, highlight the parameter you want to add to (or remove from) the Doppler Parameter Boxes and then click either the Left or Right mouse button.

Depth

The Depth Parameter Box shows the distance (in millimeters) of the axial center sample volume from the face of the transducer.

SV (Sample Volume Length)

The SV Parameter Box shows the sample volume which is the axial length of the area from which the Doppler signals are obtained. The larger the sample volume, the longer the duration of the pulse bursts, and consequently the higher the ultrasound output power. See Technical Description of the Sample Volume in Chapter S7.

Gain

The Gain Parameter Box shows the amplification of the received Doppler signal (HW gain).

Filter

The Filter box shows the current high pass filter cutoff frequency in Hz.

Ampl (Amplitude)

The Ampl Parameter Box shows the current amplitude as a percentage of the maximum system output of the ultrasound signal.

Power

The Power box shows the current ultrasound output as a percentage of maximum.

TIC/TIS

Depending on which type of transducer is active, the TIC/TIS box will display either the TIC or TIS index automatically. These indexes are used to provide information to clinical operators at the time of the patient examination such that ultrasound exposure to the patient may be reasonably minimized.

The TIC box displays the current **Cranial Bone Thermal Index.** This Index, which is based on a model where the bone is located close to the surface of the skin, is displayed for the 1.6 MHz and 2 MHz transcranial transducers.

The TIS box displays the current **Soft Tissue Thermal Index**. This Index, which is based on a model where the ultrasound travels through soft tissue only, is displayed for the 4 MHz and 8 MHz extracranial transducers as well as the 16 Mhz and 20 MHz microvascular transducers.

Note: The higher the TIC or TIS value, the greater the tissue warming will be. Adjustments of the **Sample**, **Amplitude**, and the **Scale** parameters will cause the thermal index numbers to change.

Note: Refer to Chapter H1 for more information concerning this index.

Note: The TIC/TIS box is always displayed on systems in the USA and cannot be configured OFF in the acquire mode.

Mean (Mean Velocity)

The Mean Parameter Box shows the Mean velocity of the Doppler spectra. The Mean velocity is a calculation of the average curve measured over the complete sweep of the envelope.

Sys (Systolic)

The Sys Parameter Box shows the peak Systolic flow which is the highest velocity in the spectral display as measured by the envelope. See **Note 1**.

Dia (Diastolic)

The Dia Parameter Box shows the end Diastolic flow which is the lowest velocity in the spectral display as measured by the envelope. See **Note 1**.

PI (Pulsatility Index)

The PI Parameter Box shows the **Gosling's Pulsatility Index** which is a measure of pulsatility. It is calculated as follows:

P.I. = Psys - Edia / Mean

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

See **Note 1**.

RI (Resistance Index)

The RI Parameter Box (Pourcelot Resistance Index) shows a second measurement of pulsatility. It is calculated as follows:

R.I. = Psys - Edia / Psys

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

See N**ote 1**.

D-Mean (Delta Mean)

The D-Mean Parameter Box shows the Delta Mean velocity of the Doppler spectra. The Delta Mean velocity is a similar calculation to the standard Mean Velocity but this box is displayed as a percent of a standard value. By using the Set Delta Mean function, the 100% level for the Delta Mean box is taken from the present Mean value. After this time, the Delta Mean parameter box will display a percent value relative to this level which essentially displays the change in the mean velocity with respect to the point in time where the Set Delta Mean was used.

Note 1: Signal Calculations
The measurements described on this page are made every cardiac cycle. Each signal calculation is made from the envelope of the Doppler signal. The Mean velocity is derived from the envelope and is updated every second, independent of the cardiac cycle. For all calculations, the parameters related to blood flow toward the probe are displayed as positive values, and those related to blood flow away from the probe are displayed as negative values regardless of the **Direction** setting.

Choose the Doppler colors

You can choose to view the displayed Doppler spectrum in either color or grayscale.

1. Click on **View** (Figure 1).

2. Click on **Spectral Palette**.

3. Click on either **Color, Grayscale**, or on **Color Mode 2** as desired (Figure 2).

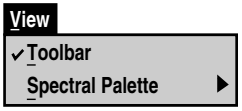


Figure 1: Click on View and then on Spectral Palette.

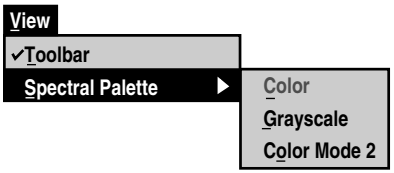


Figure 2: Click on Color, Grayscale, or on Color Mode 2 as desired. The current selection will appear grayed on the menu.

Display the Toolbar

You can choose to display (Figure 1) or not display (Figure 2) the Toolbar which provides another way to execute commands to the system. Turning the Toolbar off provides more space for the spectral display. Most users will display the Toolbar.

1. Click on **View** (Figure 3).

2. Click on **Toolbar**. A check mark = Enabled.

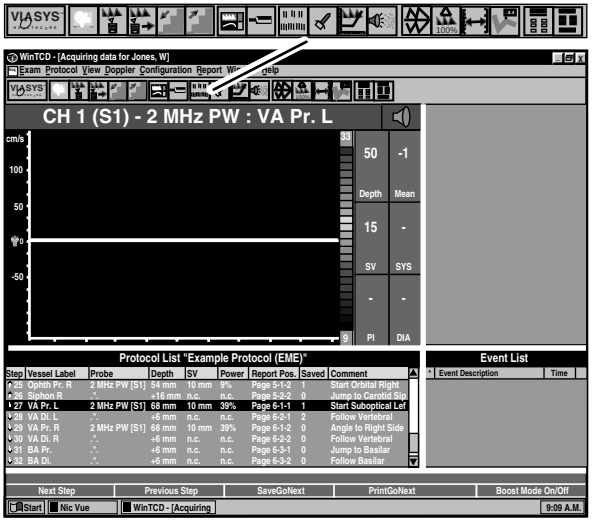


Figure 1: Example display with Toolbar turned on.

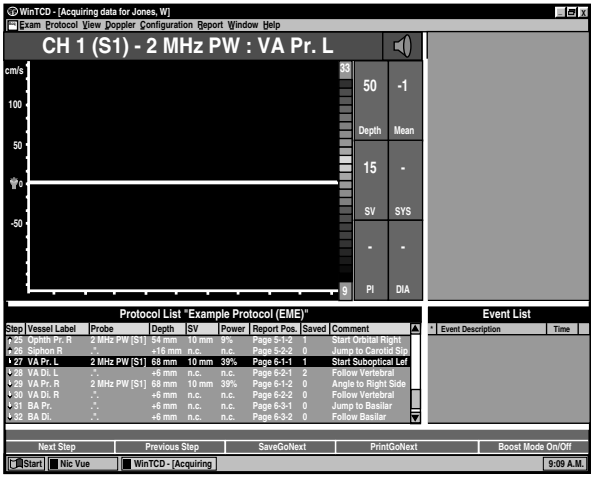


Figure 2: Example display with Toolbar turned off.

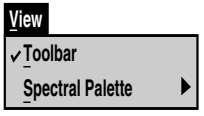


Figure 3: Click on View and then on Toolbar. A check mark = Enabled.

Set the Copy Window

The Copy window displays saved Spectral Snapshots.

Figure 1 illustrates an example screen display with saved spectral snapshots.

Note: The Copy window is always displayed on the screen unless the Spectral window is increased to its maximum width or the Event List is increased to its maximum height.

The Copy window holds the last 20 saved spectral display records and can be scrolled forwards and backwards to view all of the records.

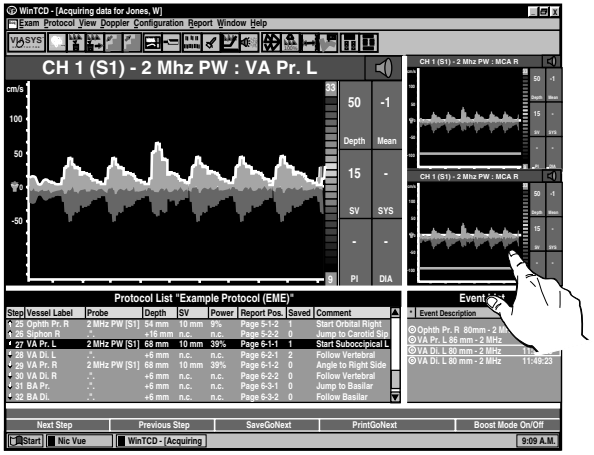

WinTCD - [Acquiring data for Jones, W]
Exam Protocol View Doppler Configuration Report Window Help
CH 1 (S1) - 2 Mhz PW : VA Pr. L
cm/s
100
50
0
-50
50
-1
Depth
Mean
15
SV
SYS
PI
DIA
CH 1 (S1) - 2 Mhz PW : MCA R
CH 1 (S1) - 2 Mhz PW : MCA R
Protocol List "Example Protocol (EME)"
Step Vessel Label Probe Depth SV Power Report Pos. Saved Comment
25 Ophth Pr. R 2 MHz PW [S1] 54 mm 10 mm 9% Page 5-1-2 1 Start Orbital Right
26 Siphon R ." +16 mm n.c. n.c. Page 5-2-2 0 Jump to Carotid Sip
27 VA Pr. L 2 MHz PW [S1] 68 mm 10 mm 39% Page 6-1-1 1 Start Suboccipical L
28 VA Di. L ." +6 mm n.c. n.c. Page 6-2-1 2 Follow Vertebral
29 VA Pr. R 2 MHz PW [S1] 68 mm 10 mm 39% Page 6-1-2 0 Angle to Right Side
30 VA Di. R ." +6 mm n.c. n.c. Page 6-2-2 0 Follow Vertebral
31 BA Pr. ." +6 mm n.c. n.c. Page 6-3-1 0 Jump to Basilar
32 BA Di. ." +6 mm n.c. n.c. Page 6-3-2 0 Follow Basilar
Event List
Event Description
Ophth Pr. R 80mm - 2 MHz
VA Pr. L 86 mm - 2 MHz
VA Di. L 80 mm - 2 MHz
VA Di. L 80 mm - 2 MHz 11:49:23
Next Step
Previous Step
SaveGoNext
PrintGoNext
Boost Mode On/Off
Start
Nic Vue
WinTCD - [Acquiring
9:09 A.M.

Figure 1: Example screen display with Saved Spectral Snapshots.

Loading a Protocol

The Protocol Manager panel lets you choose from a list of Protocols that can be quickly loaded into the system for immediate use.

1. Click on the **Protocol Manager** button or

   Click on **Protocol** (Figure 1) and then on **Protocol Manager**.

2. Either click on the desired **Protocol** and then click on **Load** or double-click on the **Protocol** you want to load (Figure 2).

   The **Diamond** symbol identifies the current default protocol and the right pointing **Arrow** identifies which protocol is currently loaded on the system.

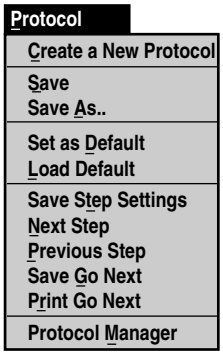


Figure 1: Click on Protocol and then on Protocol Manager.

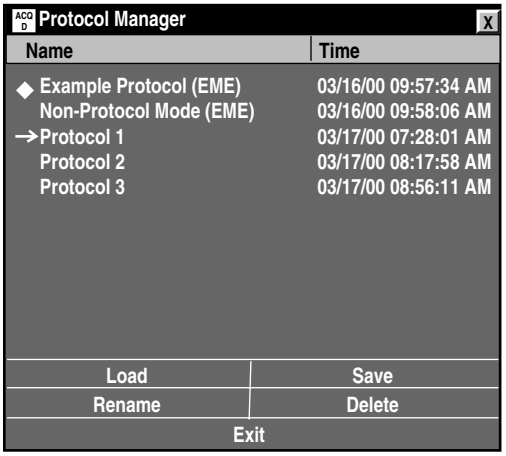


Figure 2: Click on (highlight) the desired Protocol and then click on Load or just double-click on the desired Protocol.

The Protocol List window

You can create a list of examination steps (corresponding to spectral records to be saved) which then are used to guide you through your routine examination. Each step will contain configuration information to automatically set up the system for the next vessel of interest. Protocols reduce the number of keystrokes, thus reducing the time needed for the examination.

The Protocol Step window contains nine columns (Figure 1).

Step and Flow Direction

The first column contains the step numbers as well as a Flow Direction symbol (red arrow = flow toward, blue arrow = flow away).

Vessel label

The second column displays the vessel label including the side flag which identifies which side is being tested.

Protocol List "Example Protocol (EME)"

Step	Vessel Label	Probe	Depth	SV (Tx, Rx)	Power	Report Pos.	Saved	Comment
↑ 25	Ophth Pr. R	2 MHz PW [S1]	54 mm	10mm, 10mm	9%	Page 5-1-2	1	Start Orbital Right
↑ 26	Siphon R	."	+16 mm	n.c.	n.c.	Page 5-2-2	0	Jump to Carotid Sip
! 27	VA Pr. L	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-1	1	Start Suboccipital L
↓ 28	VA Di. L	."	+6 mm	n.c.	n.c.	Page 6-2-1	2	Follow Vertebral
→	VA Pr. R	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-2	0	Angle to Right Side
↓ 30	VA Di. R	."	+6 mm	n.c.	n.c.	Page 6-2-2	0	Follow Vertebral
↓ 31	BA Pr.	."	+6 mm	n.c.	n.c.	Page 6-3-1	0	Jump to Basilar
↓ 32	BA Di.	."	+6 mm	n.c.	n.c.	Page 6-3-2	0	Follow Basilar

Figure 1: Protocol List window.

Transducer column

The third column displays the transducer type and mode. The possibilities are 1.6MHz PW, 2MHz PW, 4MHz PW, 8MHz PW, 16MHz PW, 20MHz PW, 4MHz CW, and 8MHz CW. If the transducer does not change from one step to the next, a (") symbol will appear in the column until a different transducer is selected. The steps showing a fixed depth setting will contain all the Doppler parameters.

Following the transducer type and mode is the socket number enclosed by parenthesis (S1, S2, S3, or S4) into which the transducer is plugged [e.g., 2MHz PW (S1)].

If the transducer/socket is configured as **Any position**, (S*) will follow the transducer type and mode [e.g., 2MHz PW (S*)].

Depth column

The fourth column displays the depth settings.

For complete steps, the actual depth is shown. CW probes will just show "CW".

For relative steps, the increase or decrease in 'mm' is displayed.

If the next step consists only of a new vessel label, "n.c." (for no change) will appear in the column for that step.

Sample Volume (S.V.) column

The fifth column displays the sample volume settings (both the Tx and the Rx values). The actual Sample Volume settings are shown in this column. CW probes will just show "CW".

If the next step consists only of a new vessel label, "n.c." (for no change) will appear in the column for that step.

Power column

The sixth column displays the power settings. The actual power is displayed in this column.

If the next step consists only of a new vessel label, "n.c." (for no change) will appear in the column for that step.

Report Position column

The seventh column displays the position of spectral display record on the report printout. Three numbers are used to define the Page Number, Row Number, and Column Number (Figure 1). For example, **5-1-2** will place the record on page **5**, row **1**, column **2**.

Saved column

The eighth column displays the Save Status.

If a record for the step has been saved, a 1 will be displayed.

If no record for the step has been saved, a 0 will be displayed.

If multiple saves have been made for the step, the number of saves will be displayed.

Extra saves for a step will be added to the end of the report printout.

Comment column

The ninth column displays the comments, if any, that have been created to describe each step.

Cursor bar

The blue cursor (if displayed) identifies the present position in the Protocol list. The bar can be moved up and down using the Up/Down Arrow keys on the Keyboard and Remote Control. You can also choose a step by clicking on the desired step.

Active Step indicator

In cases where the Blue cursor is not the active step, the active step is identified by a White cursor and a Red right pointing arrow appears in the active steps Step Number column.

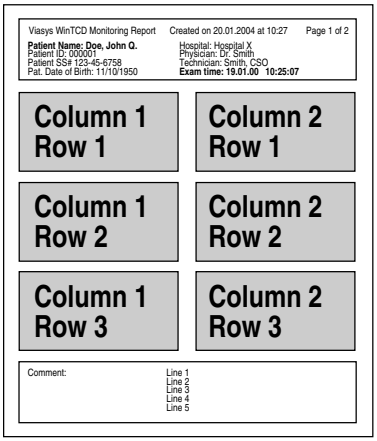


Figure 1: Report position matrix.

Saving Doppler/DSP changes made to the active Protocol step

After making adjustments to the Doppler/DSP settings (e.g., Depth, Amplitude, etc.), you can choose to save those changes permanently with the active (highlighted in blue) step.

Doppler settings can only be saved to complete steps. Display changes can be saved to all steps. See *Chapter S10* for more information.

1. Load the **Protocol step** for which you want to make Doppler/DSP setting changes.

2. Make any **Doppler/DSP settings** changes as desired using the Remote Control.

3. Click on **Protocol** (Figure 3).

4. Click on **Save Step Settings**.

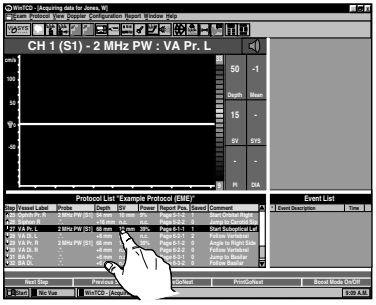


Figure 1: Load the Protocol step for which you want to make Doppler/DSP changes.

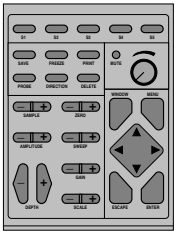


Figure 2: Use the Remote Control to make changes to the Doppler/DSP settings.

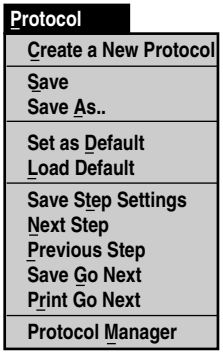


Figure 3: Click on Protocol and then on Save Step Settings.

Chapter S7
Performing an Exam

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Continued on the next page.

This chapter describes how to acquire data from your subject during an exam. It is assumed that you have already set up the screen (*Chapter S5 for Monitoring or Chapter S6 for Diagnostic*) and you are now ready to begin the exam.

Note: The majority of information in this chapter applies to both the Monitoring and Diagnostic modes. Exceptions are noted when the information is applicable to only one of the acquisition modes. In addition, the Monitoring screen display is used for the illustrations; the Diagnostic screen display will be shown only if necessary for clarity.

Legends

Diag. Only — Designates Diagnostic Mode only.

Mon. Only — Designates Monitoring Mode only.

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Connect Companion transducer(s)

Up to two transducer(s) can be connected to the ports on the side of the system.

1. Match the **Red Dots** on the transducer and system connector (Figure 1) and then firmly insert the connector until it is properly seated.

! CAUTION

To avoid damage to the transducer, grasp the connector by the **Red Dot** and pull straight out when disconnecting a transducer from the system.

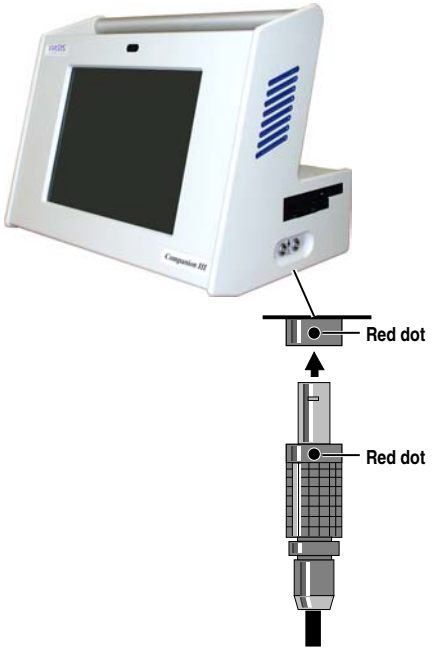


Figure 1: Align the Red Dots before inserting the connector into the Companion III system.

Connect Pioneer transducer(s)

Up to four transducer(s) can be connected to the ports on the front of the processor.

1. Match the **Red Dots** on the transducer and system connector (Figure 2) and then firmly insert the connector until it is properly seated.

! CAUTION

To avoid damage to the transducer, grasp the connector by the **Red Dot** and pull straight out when disconnecting a transducer from the system.

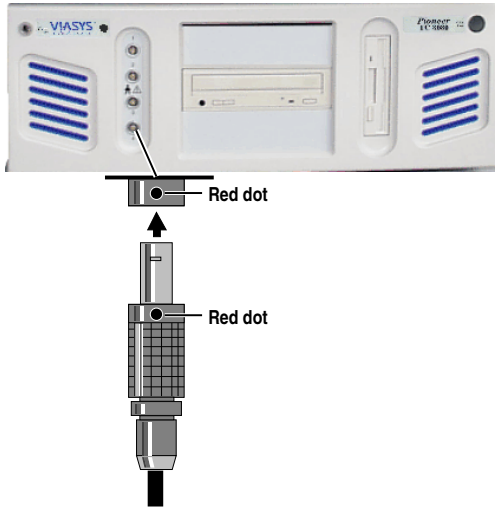


Figure 2: Align the Red Dots before inserting the connector into the Pioneer TC8080 system.

Mon. Only Load the channel settings - *Monitoring mode only*

Note: The procedures on this page are for the Monitoring Mode only, not the Diagnostic Mode.

When switching into the monitoring acquire mode, the system automatically loads a default setting. If the default Settings file is not the file you wish to use during the examination, perform either of the following procedures to select a different Settings file.

To Create a New Settings file, create a New Default Settings file, Delete a Settings file, or Rename a Settings file, see *Chapter S9* in this guide.

Note: The Settings files contain many parameters. This chapter and chapter S5 describe the various configurable features - all of which are saved in the Settings files.

If a setting, containing an M-Mode display, is selected, please refer to *Chapter S16* in this guide for all the details on using the M-Mode display.

Method 1

1. Click on the **Settings Manager** button.
2. Click on the **file** you want to use and then click on **Load** (Figure 1).

Note: The current Settings file is identified with an **Arrow** prefix. The **Diamond** prefix is the current default.

Method 2

1. Click on the **Settings** menu (Figure 2).
2. Select the **Settings Manager** menu point.
3. Click on the **file** you want to use and then click on **Load** (Figure 1).

Note: Figure 3 will not appear if the transducers are connected correctly to the system. If incorrect connections were made, make the corrections as necessary and then click on **Load**.

You can choose to override the system and click on the **Manual assignment** checkbox and then make your selections from this panel. The number of channels must however remain the same.

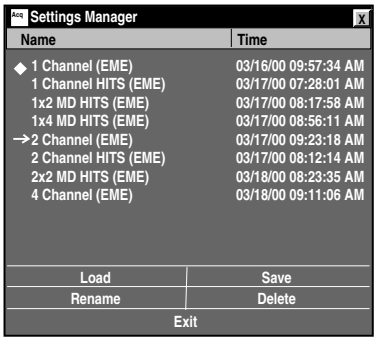


Figure 1: Click on the Settings file you want to load and then click on Load.

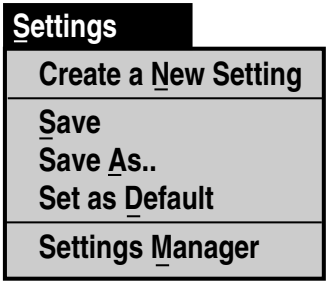


Figure 2: Click on the Settings menu and then on the Settings Manager menu point.

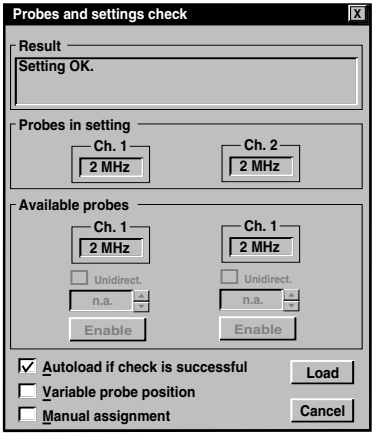


Figure 3: This panel does not appear if the probes are connected correctly to the system (Companion III example).

Diag. Only Choose the protocol - *Diagnostic mode only*

The system parameters can be set up quickly for diagnostics by selecting a previously created protocol file.

If you want to create your own protocol, see *Chapter S10* in this guide.

Use either of the following methods to choose a protocol.

Method 1

1. Click on the **Protocol Manager** button.
2. Click on the **desired file**, click on **Load** (Figure 1).
3. If Figure 2 appears, insert the correct transducers and then click on **Load.**

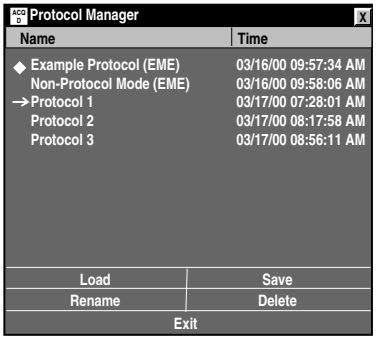


Figure 1: Click on the Protocol file you want to load and then click on Load.

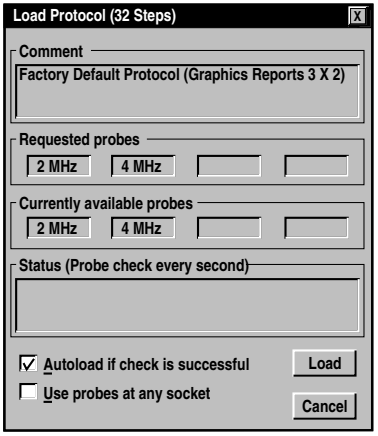


Figure 2: If this panel appears, insert the correct transducers and click on Load.

Method 2

1. Click on the **Protocol** menu (Figure 3).
2. Click on **Protocol Manager**.
3. Click on the **desired file**, click on **Load** (Figure 1).
4. If Figure 2 appears, insert the correct transducers and then click on **Load.**

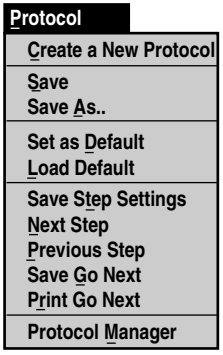


Figure 3: Click on the Protocol menu and then click on Protocol Manager.

Set up the acquisition parameters

The following topics describe how to set up the various acquisition options that you will be using to acquire Doppler data from your subject.

Note: When in Multichannel Monitoring, the correct Spectral display must be highlighted for the following functions to work. The **Probe** key toggles the focus from one Spectral channel to another. If multidepth channels are active, the **Link Channels in MD Mode** function can be used to allow adjustments (e.g. Gain) to be performed on all multidepth channels pertaining to one transducer simultaneously. Toggle this function on and off with one of the following methods.

1. Click on the **Link Channels in MD Mode** button.

- or -

2. Click on **Doppler** and then click on **Link Channels in MD Mode** (Figure 2).

- or -

3. If one of the softkey functions has been assigned **Multi Depths Link On/Off**, click on the displayed softkey or press the corresponding **S-key** on the remote control.

Choose the transducer mode (PW/CW)

The continuous (CW) transducers may also be used in a pulse wave (PW) mode. By toggling between PW/CW, you can control the mode of the active transducer.

1. Click on the **Toggle PW/CW** button.

- or -

2. Click on **Doppler** and then click on **Toggle PW/CW** (Figure 2).

- or -

3. If one of the softkey functions has been assigned **Toggle PW/CW** (Figure 1), click on the displayed softkey or press the corresponding **S-key** on the remote control.

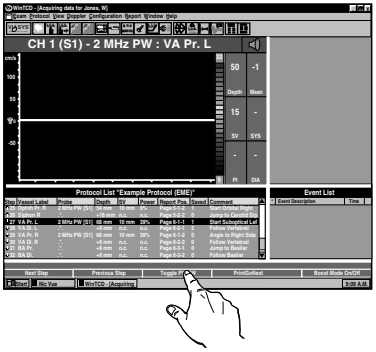


Figure 1: If one of the softkeys is labeled Toggle PW/CW, click on that button or press the corresponding S-key on the remote control.

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Curve Recording	
SoundTrak	
Boost Mode	Ctrl+Alt+F
Flow Separation	
Squelch	
Noise Reduction	
Link Channels in MD Mode	
Filter Up	Shift+F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Monitoring Mode

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Probe	F10
SoundTrak	
Boost Mode	
Flow Separation	Ctrl+Alt+F
Squelch	
Noise Reduction	
HFE Mode	Ctrl+H
Filter Up	Shift F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Diagnostic Mode

Figure 2: Click on Toggle PW/CW.

Choose the flow velocity scale units

You can choose to display the data using scale units of centimeters per second (cm/s) or kilohertz (kHz) as illustrated in Figure 1.

Note: The Doppler Parameter boxes will display in whichever units are selected.

To change the scale units, either:

1. Press the **F8** key on the keyboard.

- or -

2. If there is a softkey labeled **Units**, click that key (Figure 2) or press the corresponding S-key on the Remote Control.

- or -

3. Click on **Doppler** and then on **Units**.

- or -

4. Click on the **Change Scale Units** button.

To set the softkey functions, see *Set the Remote Control S1-S5 key functions* in *Chapter S5*.

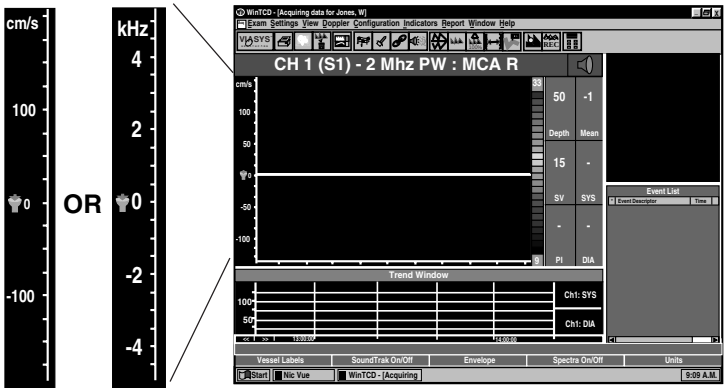


Figure 1: You can choose between cm/s or kHz scales.

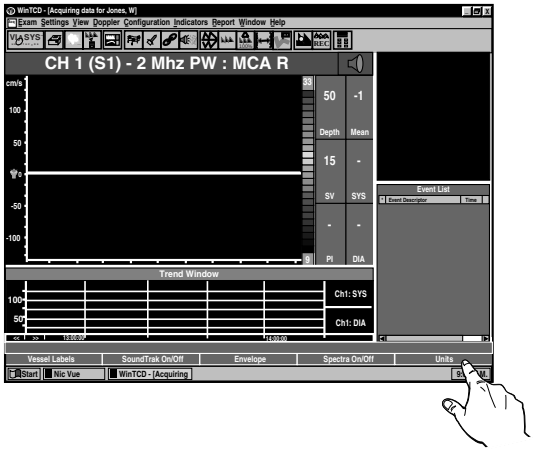


Figure 2: Position the mouse button over the Units softkey and then click the Left mouse button or press the corresponding S-Key on the remote control.

Set the flow velocity scale

Multiple scale settings are available. In Multichannel Monitoring, all spectral channels must have the same scale setting. You can change the scale to adjust the displayed velocity range of the Doppler signal. It is recommended the lowest scale setting is used to accommodate the full velocity range of the signal.

Use the **Scale** key (Figure 1) to adjust the displayed velocity scale. You may also use **Ctrl + F2** to decrease or **Shift + F2** to increase the scale setting.

The current power level is displayed in the Doppler box labeled **Power**. The higher the scale setting, the higher the pulse repetition frequency (number of pulses per second), and consequently the higher the ultrasound output. More pulses per second is equivalent to a higher power output. Proper use of these instrument settings can minimize patient exposure and optimize the results and efficiency of the equipment.

Note: Always apply the ALARA principle; use power levels that are As Low As Reasonably Achievable.

Adjust the amplitude

The current amplitude level is displayed in the Parameter box labeled **Ampl**. This value is displayed as a percentage of maximum.

Use the **Amplitude** key (Figure 2) to adjust the amplitude of the ultrasound signal. You may also use **Ctrl + F5** to decrease or **Shift + F5** to increase the amplitude.

Increasing the amplitude setting increases the voltage amplitude resulting in a higher ultrasound output at the transducer. The amplitude (or power rating) is restricted to guard against exceeding the recommended FDA Guidelines.

The amplitude setting directly influences the power of the pulse burst. A higher setting increases the amplitude, resulting in a higher ultrasound output at the transducer.

Note: Always apply the ALARA principle; use power levels that are As Low As Reasonably Achievable.

Note: The amplitude setting and the power setting are displayed in parenthesis for multi-depth receiver channels.

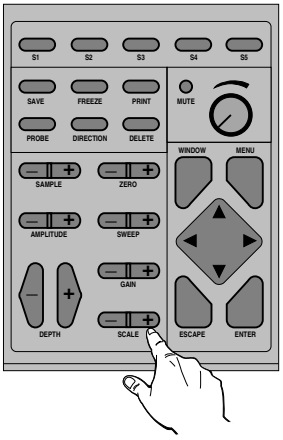


Figure 1: Scale key.
{Ctrl F2 = -}, {Shift F2 = +}

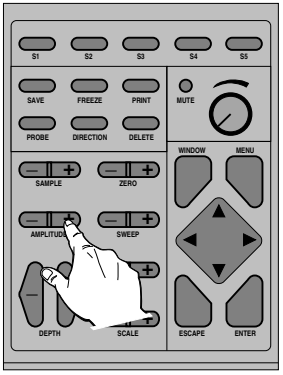


Figure 2: Amplitude key.
{Ctrl F5 = -}, {Shift F5 = +}

Adjust the sample volume depth

The **Depth** box shows the distance (in millimeters) of the sample volume axial center from the face of the transducer.

Use the **Depth** key (Figure 1) to move the sample volume either deeper or shallower. You may also use **Ctrl + F1** to decrease or **Shift + F1** to increase the depth.

The range of depth settings is limited by the pulse repetition frequency (PRF) setting so automatic scale reductions occur.

In Multi-depth mode, the depth separation between channels can be altered by using the functions **MD Expand Depths** and **MD Contract Depths**.

Note: The Sample and Depth functions do not work in the CW mode.

Adjust the sample volume length

The **SV** box shows, for pulsed-wave ultrasound, the length of the sample volume.

Use the **Sample** key to adjust the length of the sample volume (Figure 2). You may also use **Ctrl + F6** to decrease or **Shift + F6** to increase the sample volume.

The Sample volume is the axial length of the area from which Doppler signals are obtained. The sample size can range from 1 to 15 mm and its length is displayed in the Parameter box labeled **SV**. It is important to remember that the size of the sample volume influences the ultrasonic power output. The larger the sample volume, the longer the duration of the pulse burst, and consequently the higher the ultrasound output and power.

Note: Always apply the ALARA principle; use power levels that are: As Low As Reasonably Achievable.

Note: The Sample and Depth functions do not work in the CW mode. The power setting is only a function of the amplitude.

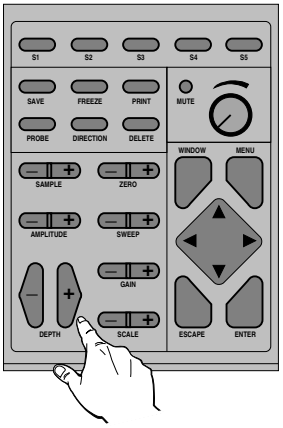


Figure 1: Depth keys. {Ctrl F1 = -}. {Shift F1 = +}

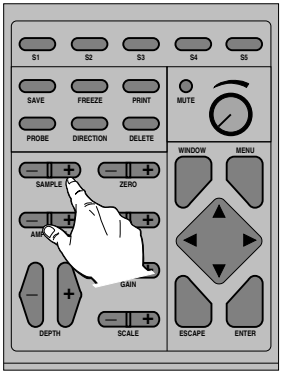


Figure 2: Sample key. {Ctrl F6 = -}, {Shift F6 = +}

Note: The sample volume setting is displayed in parenthesis for multi-depth receiver channels.

Note: See Sample Volume Clarification.

Sample volume clarification

The sample volume control varies slightly depending on the version of the Doppler hardware and the software functions used to control the feature.

The Pioneer TC8080 system and the Companion III system each have two versions of the Doppler electronics. The original version contained a boost function which was independent of the sample volume control. The present version contains a boost function which is tied together with the sample volume control. By looking in the About WinTCD dialog, you can determine the version of hardware in your system. The original systems say either Companion III hardware or Pioneer III hardware. The present systems say either Companion III MK2 hardware or Pioneer III MK2 hardware.

The following sections explain the differences in the sample volume functionality.

Note: If you have original hardware and the TX/RX Linkage s-key is not available, this can be activated by using Regedit and setting a DWord registry key (HKEY_LOCAL_MACHINE/ Software/Nicolet Biomedical/ WinTCD/Settings/ ToggleTXRXLink) to the value 1.

Original hardware

In the original systems, the **SV** box normally shows the length of the sample volume displayed as one value. This value represents both the transmit pulse length and the receiver gate time since in the normal mode of operation, the transmit pulse length and the receiver gate time are set to equal lengths. The normal mode is active when the TX/RX Linkage is set to On.

If you would like to adjust the transmit pulse length and the receiver gate time independently, you can turn the TX/RX Linkage Off by using the **TX/RX Linkage** s-key.

In this mode, the **SV** box shows two numbers representing the transmit pulse length (TX) and the receiver gate time (RX).

When unlinked, the **Sample** key on the remote control will no longer adjust the transmit length but only adjust the receiver time.

The transmit length can be adjusted by using the s-keys **Inc. TX Pulse Width** and **Dec. TX Pulse Width**.

In addition, the receive length can be adjusted by using the s-keys **Inc. RX Pulse Width** and **Dec. RX Pulse Width**.

MK2 hardware

In the MK2 hardware systems, the **SV** box shows the length of the sample volume displayed as one value representing the transmit pulse length (TX) . The **Sample** key on the remote control adjusts the transmit length but under certain circumstances can also affect the receiver gate time.

When the boost mode is Off, the receiver gate normally has a fixed length. This is 5mm for 1.6, 2, 4, and 8 MHz and 0.8mm for 16 and 20 MHz. The normal case is when the transmit pulse is longer than the fixed receiver gate length. In the case that the transmit pulse is shorter than the fixed receiver gate length, the receiver gate is set to the same length as the transmit pulse when the boost mode is Off.

When the boost mode is On, the receiver gate has a minimum length but is able to vary with the transmit sample length. The minimum value is 6mm for 1.6, 2, 4, and 8 MHz and 0.9mm for 16 and 20 MHz. If the transmit sample length is greater than the minimum receiver gate length, the receiver gate length is set to the same length as the transmit sample length. Since you usually have quite a large transmit sample length when deciding you need boost, there is a strong increase in the signal strength when toggling the boost on.

Technical description of the sample volume

There is often confusion in understanding how the sample volume length is defined and what it really means. In simple terms, the sample volume is the length of the area from which the Doppler signals are obtained. The depth setting is the distance of the axial center of the sample volume from the face of the transducer.

The data shown in the spectral display is a mix of all the signals coming from inside the sample volume. e.g. If the depth is set to 40 mm and the total sample volume length is 16 mm, then the signals seen in the display are coming from the depth range 32-48 mm.

The sample volume is axially centered at the depth setting. The total sample volume length is equal to the sum of the transmit pulse length and the receiver gate time.

The signals coming from depths closer to the displayed depth setting are weighted stronger than those near the edges of the sample volume. In our example, signals near 40 mm depth will be strong in the display but those near 32 or 48 mm depth will be weak. Figure 1 graphically shows this weighting.

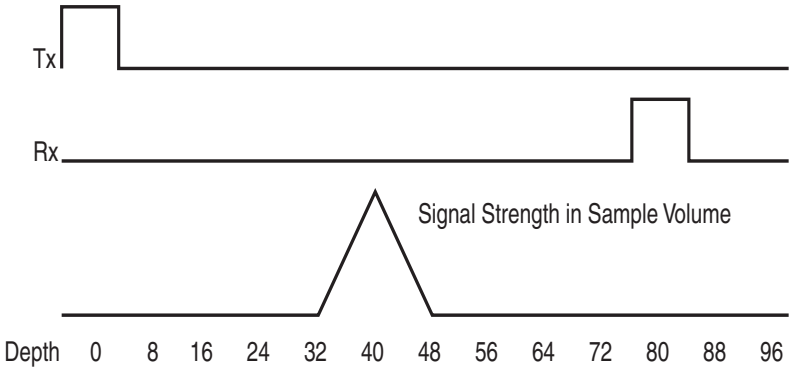


Figure 1: Normal Mode Example (TX/RX Linkage On): TX=8mm, RX=8mm, and Depth= 40mm.

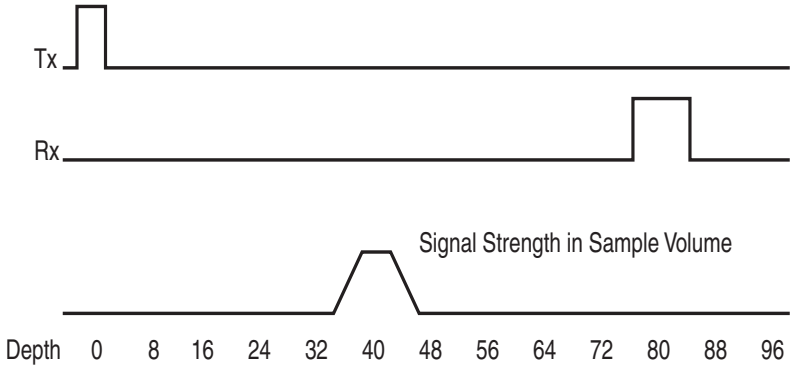


Figure 2: TX/RX Linkage Off: TX=4mm, RX=8mm, and Depth= 40mm.

In the linked mode of operation (Figure 1), the transmit pulse length and the receiver gate time are set to equal lengths (8 mm each) for optimal Doppler signal/noise ratio. The true axial length of the sample volume is a convolution of these two times. As one can see the axial sample volume length ranges from 32-48 mm depth but the majority of the signal comes from the depths closer to 40 mm.

As a second example (non linked mode of operation - Figure 2), the transmit pulse length and the receiver gate time are different lengths (4 mm and 8 mm). The true axial length of the sample volume is also a convolution of these two times but results in a different shape. As one can see, the axial sample volume length ranges from 34-46 mm depth. Depending on the lengths of the pulses the sloping of the convolution will vary to allow more precise sample volumes at the cost of the S/N ratio.

Adjust the sweep speed

When you adjust the Sweep speed, you change the time scale of the horizontal axis in the Doppler window. The sweep speed ranges from 2.0 sec to 41 sec in approximately one second steps. The range limits vary with the number of channels and can be limited by the computer speed.

Use the **Sweep** key (Figure 1) to adjust the sweep speed. You may also use **Ctrl + F8** to decrease or **Shift + F8** to increase the sweep speed.

Note: Extremely slow sweep speed settings will have an adverse effect on displayed and calculated values of P.I., Mean, Systolic, Diastolic and R.I.

Turn on the envelope

Envelope places an outline around the spectra. It is used to calculate the mean velocity, pulsatility index, etc.. An envelope may be placed around spectra designating flow towards and/or away from the transducer. The Envelope option cycles the display of the envelope curve between the following options:

- Upper envelope curve on.
- Lower envelope curve on.
- Both envelope curves on.
- Both envelope curves off.

The calculations displayed in the Parameter boxes change accordingly while they are calculated from the envelope curves.

Use any of these methods to turn on or off the envelope option:

a. Press the **F6** key on the keyboard.

b. Click on the softkey labeled **Envelope** at the bottom of the screen display.

c. Press the softkey (**S1 - S5**) on the remote control which corresponds with the softkey labeled **Envelope**.

d. Click on **Doppler** and then on **Envelope**.

e. Click on the **Switch Displayed Envelopes** button.

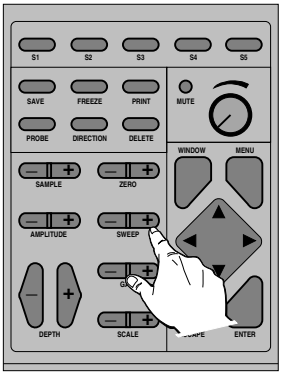


Figure 1: Sweep key. {Ctrl F8 = -}, {Shift F8 = +}

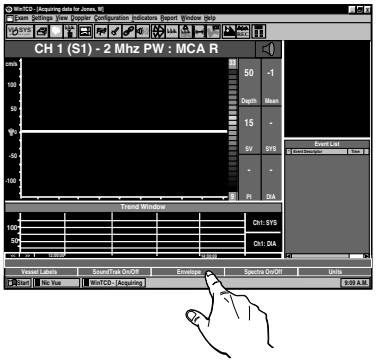


Figure 2: Click on the softkey labeled Envelope, press the corresponding remote control S-Key, or press the F6 key.

Note: If both envelope curves are switched off for a particular record, the system will display and print a "-" for all envelope related values.

Adjust the gain

The **Gain** box shows the amplification of the received Doppler signal.

Use the **Gain** key (Figure 1) to change the amplification of the received Doppler signal to obtain a more clearly defined spectrum.

Set the gain so that the envelope curve closely outlines the Doppler waveform (Figure 2). When the gain is correctly adjusted, there should be no extreme peaks or troughs in the envelopes. The gain can range from 5 to 255. As you change the gain, the current gain is displayed in the Doppler box labeled **Gain** if selected for display.

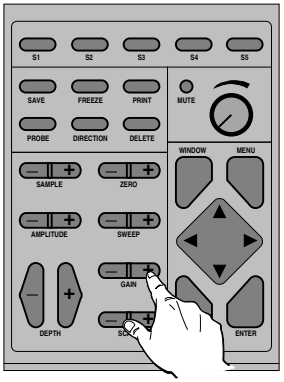


Figure 1: Gain key. {Ctrl F4 = -}, {Shift F4 = +}

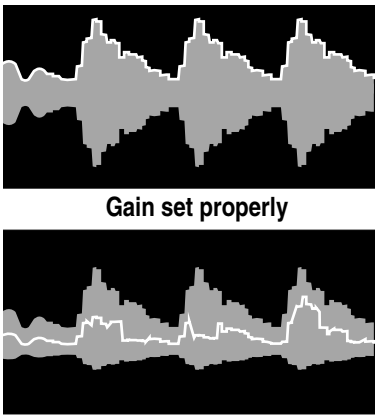


Figure 2: Examples of Gain settings.

Note: In the freeze and review windows, the gain key adjusts the software gain setting which shifts the signal strength up and down the color scale to allow fine adjustments in a post processing mode. The dB values in the color scale are adjusted appropriately.

Adjust the zero baseline

Sometimes when the Doppler signal has a high peak, it will be cut off and a portion of the peak will appear at the bottom of the Doppler window (known as aliasing). Signals below the Zero line will be cut off and displayed at the top of the screen.

Use the **Zero** key (Figure 3) to display the entire Doppler signal. You may also use **Ctrl + F3** to lower or **Shift + F3** to raise the zero baseline on the screen display.

The zero baseline will move towards the top or bottom of the window.

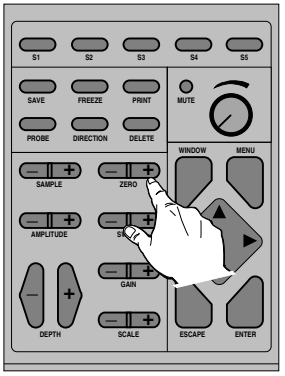


Figure 3: Zero key. {Ctrl F3 = -}, {Shift F3 = +}

Set the filter

Filtering refers to a wall filter designed to remove low frequency signals (turbulence) caused by the vessel walls, thus reducing zero baseline noise.

Note: When observing a stenosis, the wall filter may need to be turned up to filter out the strong low velocity signals.

The filter is always on and is the same for all channels.

Raising the filter

If one of the softkeys (Figure 1) was assigned Filter Up:

1. Either click on the **Filter Up** softkey.

   - or -

2. Press the corresponding **S-key** on the remote control.

Lowering the filter

If one of the softkeys (Figure 1) was assigned Filter Down:

1. Either click on the **Filter Down** softkey.

   - or -

2. Press the corresponding **S-key** on the remote control.

Note: You may also use **Ctrl + F9** to decrease or **Shift + F9** to increase the filter.

Set the direction of blood flow

The direction of blood flow with respect to the transducer is identified by the **Blood Flow icon** (Figure 2).

Use the **Direction** key (Figure 3) to change the displayed blood flow direction. You may also use the **F4** key on the keyboard or simply click on the **Blood Flow icon** itself.

When the **arrow is red**, blood flow above the zero line is toward the transducer.

When the **arrow is blue**, blood flow above the zero line is away from the transducer.

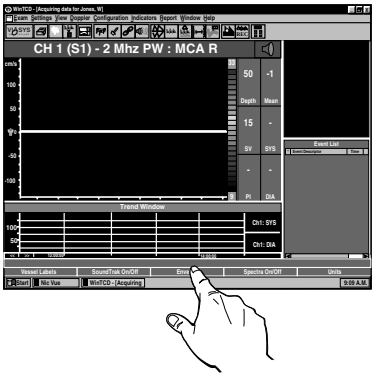


Figure 1: If one of the softkeys is labeled Filter Up or Filter Down, click on that button or press the corresponding S-key on the remote control. In addition, Ctrl+F9 can be used to lower the filter and Shift+F9 can be used to raise the filter setting.

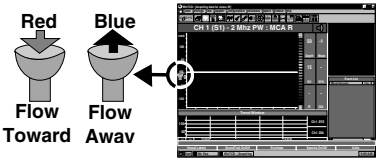


Figure 2: Blood flow icons.

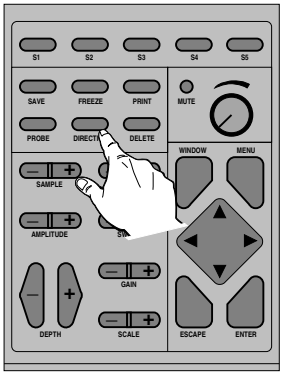


Figure 3: Direction {F4} key.

Turning SoundTrak on/off

SoundTrak allows the system to record both audio Doppler data and spectral data when snapshots are saved. If SoundTrak was turned on while collecting the Doppler data, the audio will be played back in sync with the spectral data. You can choose to turn SoundTrak on and off at any time during the exam.

When SoundTrak is turned on and a Doppler display is saved to the Copy window, a yellow marker is placed in the Event List and the Trend window; if turned off, the marker is colored green.

Note: Turning SoundTrak on will take up more memory space for recording the audio data. Make sure you have sufficient memory space available before you begin the exam and enable SoundTrak.

You can use any of these methods to turn SoundTrak on or off.

Note: When the Indicator algorithm is running, the SoundTrak function is turned on automatically and cannot be turned off.

Method 1

1. Click on the **SoundTrak** button (Figure 1). SoundTrak is enabled when the button is depressed.

Method 2

1. Click on **Doppler** and then on **SoundTrak** (Figure 2). A checkmark shows SoundTrak is enabled.

Method 3

1. If one of the S-keys (Figure 3) at the bottom of the screen display is assigned the **SoundTrak On/Off** function, click on the button or press the corresponding **S-key** on the remote control.

Note: The ability to record the digital audio data for the whole examination is also available as an option called Continuous SoundTrak. A special software license is required for this feature. Please refer to Sections S8 and S17 for more information on this topic.

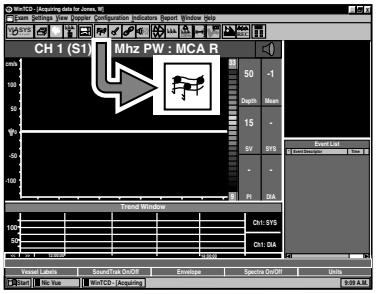


Figure 1: Click on the SoundTrak On/Off button.

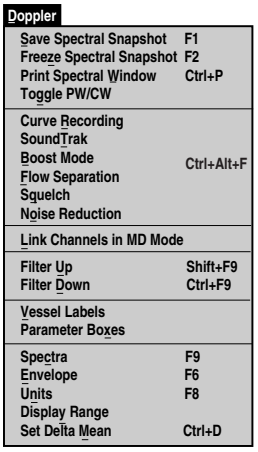


Figure 2: Click on Doppler and then on SoundTrak.

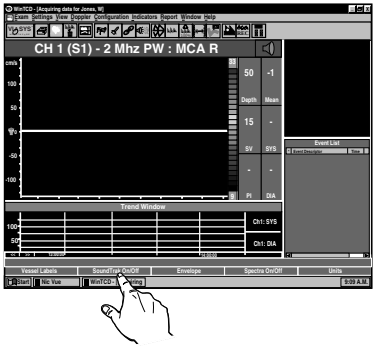


Figure 3: Click on the SoundTrak button or press the corresponding S-key on the remote control.

Turning the speaker on/off

You can turn the speaker(s) on/off while collecting Doppler data using either of these methods.

Note: The Speaker symbol on the spectral display (Figure 1) identifies whether the speaker is muted.

Method 1

1. Click on the **Speaker** symbol (Figure 1).

Method 2

1. Press the **Mute** button on the remote control (Figure 2).

Note: Depending on the number of channels/transducers used while recording the Doppler with SoundTrak turned on, either the left, right, or both speakers may play back the SoundTrak when reviewing the Doppler. This is determined automatically by the system.

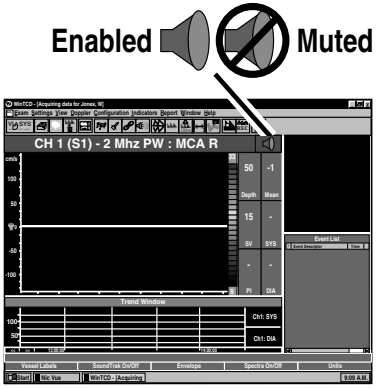


Figure 1: The speaker symbol shows if the speaker is muted. You can turn the speaker on or off by clicking on the speaker symbol.

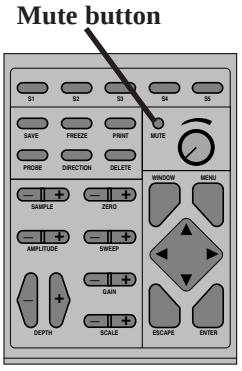


Figure 2: Press the Mute button to turn all speakers on or off.

Adjusting the audio volume

The Audio volume can be adjusted for both the running Spectral displays as well as the Soundtrak records. These are independent adjustments, the focussed window receives the adjustment.

Use the following control to adjust the audio volume level.

1. Adjust the **Volume knob** on the remote control (Figure 1).

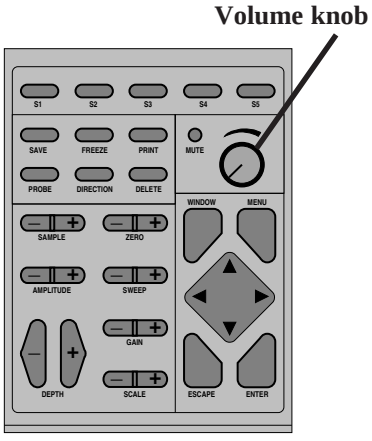


Figure 1: Adjust the Volume knob to select the desired audio volume. In addition, Ctrl+F7 can be used to lower the volume and Shift+F7 can be used to raise the volume setting.

Note: The last used audio volume level is saved automatically and recalled the next time the program is run.

Activating the audio flow separation

The separation of the audio signals according to flow direction can be toggled on and off. When the flow separation is on, toward the probe signals will be heard in the right speaker and away from the probe signals will be heard in the left speaker.

Use the following control to toggle the function on and off.

1. Click on **Doppler** and then click on **Flow Separation** (Figure 2).

- or -

2. If one of the softkey functions has been assigned **Flow Separation On/Off**, click on the displayed softkey or press the corresponding **S-key** on the remote control.

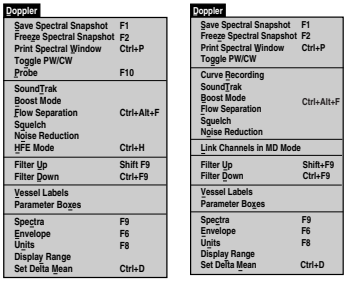


Figure 2: Click on Doppler and then on Flow Separation or Squelch to toggle the functions on and off. A checkmark means it is currently enabled.

Activating the audio squelch function

There is a squelch function available for the audio signals. The squelch function automatically chops off the very high intensity audio signals to reduce loud peaks in the audio volume. This function can be used to reduce the disturbing noise which occurs when gel is applied to the transducer.

Use the following control to toggle the function on and off.

1. Click on **Doppler** and then click on **Squelch** (Figure 2).

- or -

2. If one of the softkey functions has been assigned **Squelch On/Off**, click on the displayed softkey or press the corresponding **S-key** on the remote control.

Toggling the audio noise reduction

The Pioneer TC8080 system and the Companion III system each have two versions of the Doppler electronics. The original version contained noise reduction circuitry for the audio signals which was not adjustable. The present version contains the same noise reduction circuitry for the audio signals but allows this to be toggled on and off .

By looking in the About WinTCD dialog, you can determine the version of hardware in your system. The systems without the noise reduction toggle have a PCI Board Type 1. The systems with the noise reduction toggle have a PCI Board Type 2.

When the noise reduction function is toggled on, the menu point is checked and the icon is shown as pressed. The electronics for the noise reduction are switched on - removing the background hiss. When the function is toggled off, the menu point is not checked and the icon is shown as not pressed. The electronics for the noise reduction are switched off - allowing the background hiss.

Use one of the following methods to toggle the function on and off.

Method 1

1. Click on the **Noise Reduction On/Off** button.

Method 2

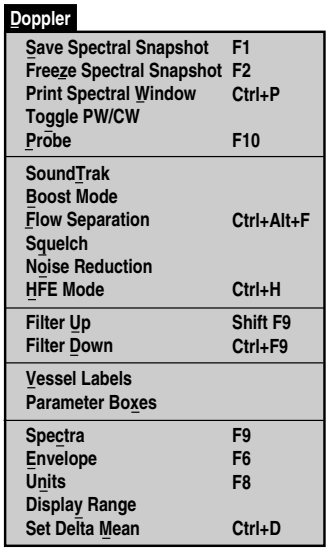
1. Click on **Doppler** and then on **Noise Reduction** (Figure 1).

Method 3

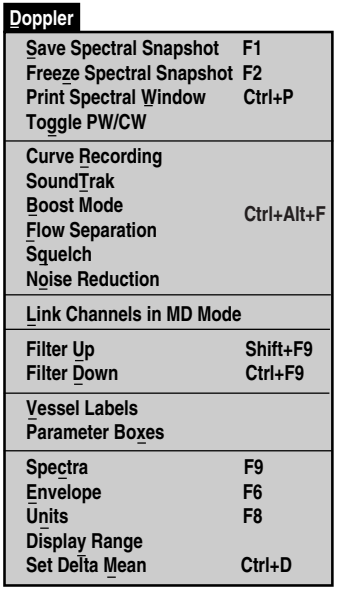
1. If one of the softkeys was assigned the **Noise Reduction** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

Note: It is recommended to turn the noise reduction circuitry off when measuring high velocity signals. These jets often sound like background noise and can get filtered out from the audio signal. The spectral signal is not affected by the noise reduction.

Note: If your system does not support the noise reduction toggle, the Noise Reduction functions will not be available.



Diagnostic



Monitoring

Figure 1: Click on Doppler and then on Noise Reduction to toggle the Noise Reduction.

Toggling the Boost mode level

The Pioneer TC8080 system and the Companion III system each have two versions of the Doppler electronics. The original version contained a boost function which was independent of the sample volume control and had three Boost levels available: Off, Low, and High. The present version contains a boost function which is tied together with the sample volume control and has two Boost levels available: Off and On.

By looking in the About WinTCD dialog, you can determine the version of hardware in your system. The original systems say either Companion III hardware or Pioneer III hardware. The present systems say either Companion III MK2 hardware or Pioneer III MK2 hardware.

The systems with original hardware adjust the amplification of the received Doppler signals. The MK2 hardware systems adjust the length of the receiver gate to alter the signal strength.

Note: Refer to the Sample Volume Clarification for the MK2 hardware for more detailed information.

Use the Boost mode to increase the signal strength, thus enhancing your ability to record and inspect the signals.

Method 1

1. Click on the **Boost Mode On/Off** button.

Method 2

1. Click on **Doppler** and then on **Boost Mode** (Figure 1).

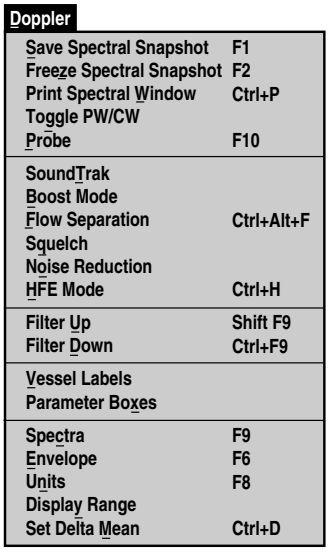
Method 3

1. If one of the softkeys was assigned the **Boost Mode** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

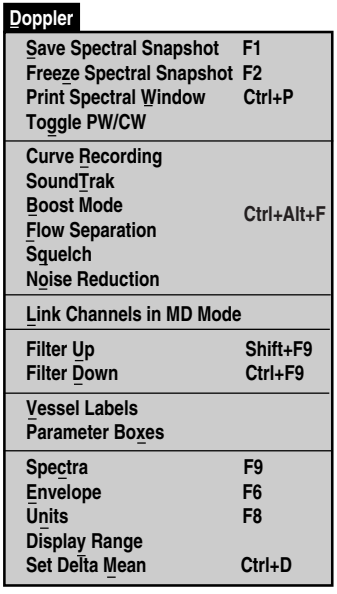
Note: The Boost mode does not affect the power output.

Note: It is recommended to only use the Boost mode when really needed. Overloading the electronics on normal signals can cause mirror signals where the flow direction is not well separated.

Note: In multidepth mode, the boost state is always toggled across all multidepth channels associated with the selected transmit channel. It is possible to have boost on channels 1A and 1B with no boost on channels 2A and 2B. However, it is not possible to have boost on channel 1A and no boost on channel 1B.



Diagnostic



Monitoring

Figure 1: Click on Doppler and then on Boost Mode to toggle the Boost level.

Toggling the High Frequency Enhance *Diagnostic mode only*

The High Frequency Enhance (HFE) mode is a two stage filtering operation which enables better identification of high frequency jets in cerebral blood flow in the diagnostic mode.

The first filter stage helps reduce wall thump at low frequencies and is applied to the audio as well as the spectral data.

The second filter stage is the High Frequency Boost filter which is applied ONLY to the displayed colors. For frequencies below the break frequency (by default 3kHz) no enhancement is made. After the break frequency a linearly increasing dB value is added to the dB value coming from the DSP processor before the spectral color is assigned. That is for every frequency bin above the break frequency an increasing dB value is added (by default 2.8dB per bin).

When this mode is switched on the baseline (zero line) should be moved to the bottom of the screen so that the top of the screen is the maximum flow velocity.

The High Frequency Enhance (HFE) mode can be toggled on and off for the highlighted spectral display by using any one of the following methods:

Method 1

1. Click on the **High Frequency Enhance** button.

Method 2

1. Click on **Doppler** and then on **HFE Mode** (Figure 1).

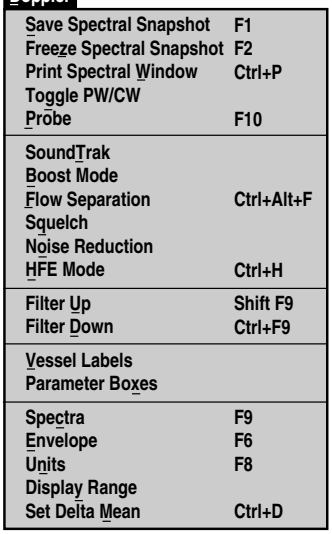
Method 3

1. If one of the softkeys was assigned the **HFE Mode On/Off** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

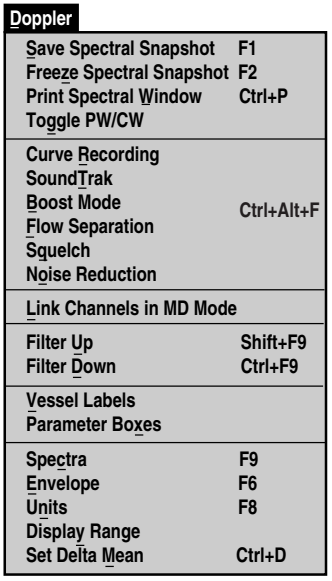
Setting the HFE Breakpoint

For better fine tuning to match the signal at hand, the HFE Breakpoint frequency can be altered by using the **HFE Breakpoint** s-key. The frequency can be changed from 2000 Hz up to 5000 Hz in steps of 1000 Hz.

Note: The display of the spectral envelope curves will be turned off automatically when the HFE mode is activated. They are reactivated automatically when the HFE mode is turned off. The envelope curves can be manually turned on during the HFE mode, if desired, by using the standard **Envelope** function.



Diagnostic



Monitoring

Figure 1: Click on Doppler and then on High Frequency Enhance to toggle the HFE Mode.

Viewing the Spectra

You can choose to view the Doppler display without (Figure 1) or with (Figure 2) spectra.

1. If one of the softkeys is labeled Spectra On/Off, click on that **softkey** (Figure 3), press the corresponding **S-key** on the remote control.

- or -

1. Click on **Doppler** and then on **Spectra**.

- or -

1. Click on the **Spectra On/Off** button**.**

See ***Setting the Remote Control S1 - S5 key functions*** in *Chapter S5*.

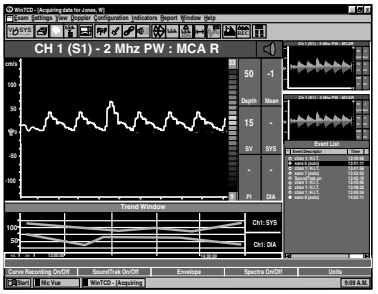


Figure 1: Example display with Spectra turned off.

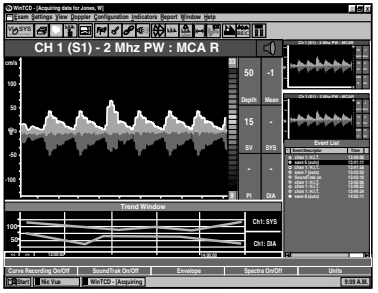


Figure 2: Example display with Spectra turned on.

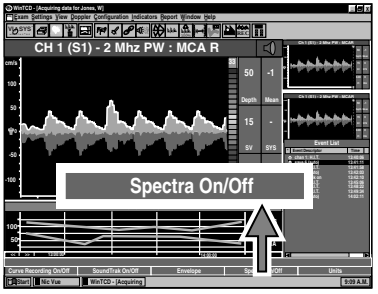


Figure 3: Click on Spectra On/Off (or press the corresponding S-Key on the remote control).

Saving Spectral Snapshots

There are five different methods to save spectral records:

Method 1

1. When you see a display you want to save for review, press the **Save** key (Figure 1) on the remote control.

Method 2

1. Press **F1** on the keyboard.

Method 3

1. Click on the **Save Snapshot** button.

Method 4

1. Click on **Doppler** and then on **Save Spectral Snapshot**.

Method 5 - Monitoring Mode only

1. Enable the **Indicator** algorithm to automatically save the spectra each time a H.I.T.S. occurs.

See *Enabling the Indicator* later in this chapter.

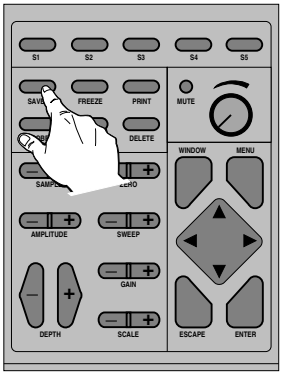


Figure 1: Press the Save key on the remote control or press F1 on the keyboard to manually save the current Doppler screen to the hard disk.

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Curve Recording	
SoundTrak	
Boost Mode	Ctrl+Alt+F
Flow Separation	
Squelch	
Noise Reduction	
Link Channels in MD Mode	
Filter Up	Shift+F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Monitoring Mode

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Probe	F10
SoundTrak	
Boost Mode	
Flow Separation	Ctrl+Alt+F
Squelch	
Noise Reduction	
HFE Mode	Ctrl+H
Filter Up	Shift F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Diagnostic Mode

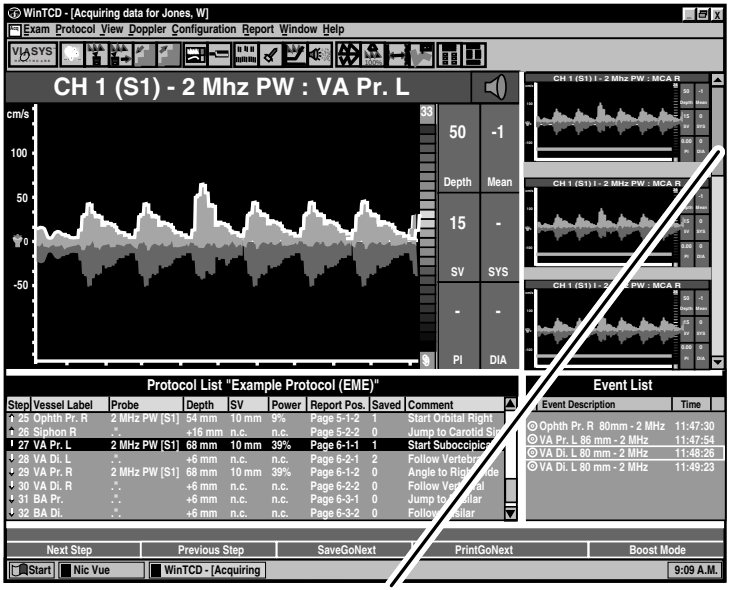
Figure 2: Click on Doppler and then Save Spectral Snapshot.

The Copy Window

As you are collecting Doppler data, the last 20 saved spectral snapshots will be displayed in the Saved Spectral Snapshots (Copy) window at the right side of the screen display (Figure 1).

Note: The newest spectra saved appears at the bottom of the Copy Window and all other previously saved spectra shift upward. Use the scroll bar when the window is full to bring the other spectra back into view.

By double clicking on saved spectral displays in the Copy Window, the saved records can be post processed. See ***Reviewing saved spectral snapshots*** in *Chapter S8*.


WinTCD - [Acquiring data for Jones, W]
Exam Protocol View Doppler Configuration Report Window Help
CH 1 (S1) - 2 Mhz PW : VA Pr. L
cm/s
100
50
0
-50
50
-1
Depth
Mean
15
SV
SYS
PI
DIA
Protocol List "Example Protocol (EME)"
Step Vessel Label Probe Depth SV Power Report Pos. Saved Comment
25 Ophth Pr. R 2 MHz PW [S1] 54 mm 10 mm 5% Page 5-1-2 1 Start Orbital Right
26 Siphon R +16 mm n.c. n.c. Page 5-2-2 0 Jump to Carotid Sig
27 VA Pr. L 2 MHz PW [S1] 68 mm 10 mm 39% Page 6-1-1 1 Start Suboccipica
28 VA Di. L +6 mm n.c. n.c. Page 6-2-1 2 Follow Vertebr
29 VA Pr. R 2 MHz PW [S1] 68 mm 10 mm 39% Page 6-1-2 0 Angle to Right Side
30 VA Di. R +6 mm n.c. n.c. Page 6-2-2 0 Follow Ver al
31 BA Pr. +6 mm n.c. n.c. Page 6-3-1 0 Jump to ilar
32 BA Di. +6 mm n.c. n.c. Page 6-3-2 0 Follow ilar
Event List
Event Description Time
Ophth Pr. R 80mm - 2 MHz 11:47:30
VA Pr. L 86 mm - 2 MHz 11:47:54
VA Di. L 80 mm - 2 MHz 11:48:26
VA Di. L 80 mm - 2 MHz 11:49:23
Next Step
Previous Step
SaveGoNext
PrintGoNext
Boost Mode
Start
Nic Vue
WinTCD - [Acquiring
9:09 A.M.

Saved Spectral Snapshots Scroll Bar

Use the scroll bar to view other Spectra that have been saved.

Figure 1: The Copy Window displays the various Doppler screen displays that have been saved to the hard disk.

Freezing the display

You can freeze the current Spectral display at any time for closer inspection (Figure 1), postprocess with Gain, Zero, etc., and then, if you wish, save a Snapshot of the frozen display for later inspection.

Method 1

1. Press the **Freeze** key on the Remote Control (Figure 2).

Method 2

1. Press the **F2** key on the keyboard (Figure 3).

Method 3

1. Click on **Doppler** and then on **Freeze Spectral Snapshot**.

Method 4

1. Click on the **Freeze Spectral Snapshot** button.

To save a snapshot of the frozen spectral display, see Saving Spectral Snapshots earlier in this chapter.

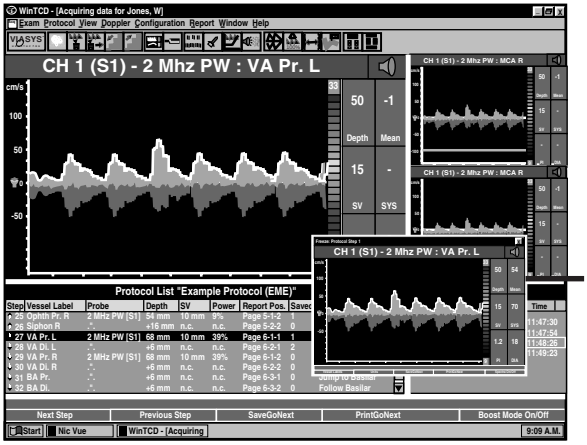


Figure 1: The resulting window after freezing the spectral display.

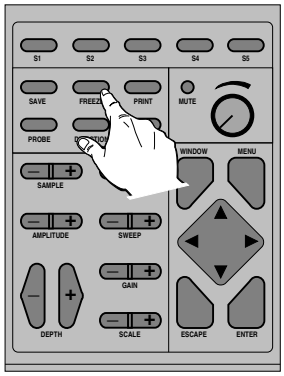


Figure 2: Press the Freeze key.

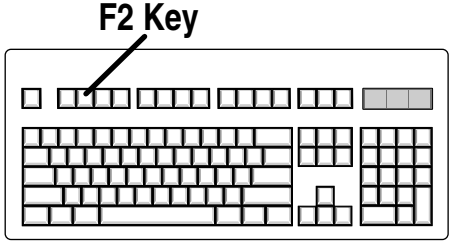


Figure 3: Press the F2 key to freeze the spectral display.

Enlarging a Frozen window

You can enlarge a Frozen window to help make visual inspections easier.

If the Freeze window's size and position are altered, they will be maintained for the rest of the session. These can be saved to the Protocol and Settings files as defaults.

1. Position the mouse pointer over one of the corners of the Frozen window (Figure 1) until the pointer changes to a Resize icon.

2. Press and hold down the mouse button and then drag the mouse until the window is the desired size.

Note: You can also resize the Frozen window unproportionally by clicking on and dragging one of the sides of the window rather than one of its corners.

Moving a Frozen window

You can move a Frozen window anywhere on the screen display to allow you to view the panel(s) hidden behind it.

1. Click on the Frozen window's title bar (Figure 2) and then hold down the mouse while dragging the window to its new location.

Closing a Frozen window

You can remove a Frozen window from the screen display at any time by using any one of the methods below:

1. Press the **Freeze** key on the Remote Control again or press **Save**.

2. Click on the small X in the upper right corner of the Frozen window's title bar.

3. Press the **F2** key on the keyboard.

4. Click on **Doppler** and then on **Freeze Spectral Snapshot** to remove the check mark.

5. Click on the **Freeze Spectral Snapshot** button.

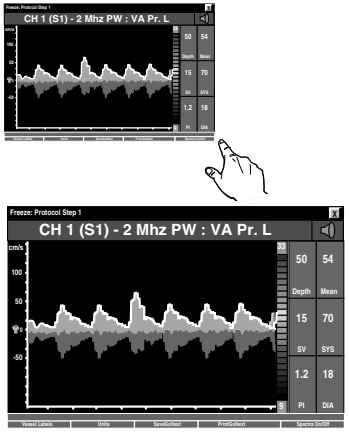


Figure 1: Click on any corner of the Frozen window and drag it until the window is the desired size.

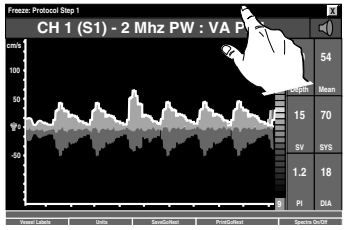


Figure 2: Click on the Title Bar and drag the window until it is at the desired location on the screen display.

Reading calculations from the Parameter boxes

Following is a description of the Parameter boxes that display the results of measurements obtained at the completion of every cardiac cycle or every second. Each signal calculation is made from the envelope of the Doppler signal. Regardless of the Direction setting, all calculated parameters related to blood flowing toward the transducer are displayed as positive values while those related to blood flowing away from the transducer are displayed as negative values.

Setting the Delta Mean 100% Reference Level

When using the Delta Mean parameter box, the 100% reference level must be set. You can set the reference level for the delta mean calculation of the highlighted spectral display by using one of the following methods:

1. If one of the softkeys is labeled **Set Delta Mean**, click on that **softkey** or press the corresponding **S-key** on the remote control.

- or -

1. Click on **Doppler** and then on **Set Delta Mean**.

- or -

1. Click on the **Set Delta Mean** button**.**

Note: The measurements described on this page are made every cardiac cycle. Each signal calculation is made from the envelope of the Doppler signal. The Mean velocity is derived from the envelope and is updated every second, independent of the cardiac cycle. For all calculations, the parameters related to blood flow toward the transducer are displayed as positive values, and those related to blood flow away from the transducer are displayed as negative values regardless of the **Direction** setting.

Note: In the cases where the signal quality is so poor that the envelope curve cannot properly follow the signal, there is the possibility to manually calculate the parameter box values by setting cursors in the freeze or spectral review windows. Refer to the section ***Manually Recalculating Values*** in *Chapter S8* for more information on this topic.

Mean (Mean Velocity)

The **Mean** box shows the Mean velocity of the Doppler envelope. The Mean velocity is a calculation of the average curve measured over the complete sweep of the envelope. You can choose three different combinations of measurement results (Figure 1).

Sys (Systolic)

The **Sys** box shows the peak Systolic flow which is the highest velocity in the spectral display as measured by the envelope.

RI (Resistance Index)

The **RI** box shows the Pourcelot measurement of pulsatility. It is calculated as follows:

R.I. = Psys - Edia / Psys

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

PI (Pulsatility Index)

The **PI** box shows the Gosling's Pulsatility Index which is a measurement of pulsatility. It is calculated as follows:

P.I. = Psys - Edia / Mean

where: Psys = Peak Systolic Flow
Edia = End Diastolic Flow

1. Click on the **Envelope** softkey (or press the corresponding S-key on the remote control) or press the **F6** key on the keyboard until the desired display appears.

Dia (Diastolic)

The **Dia** box shows the end Diastolic flow which is the lowest velocity in the spectral display as measured by the envelope.

D-Mean (Delta Mean)

The D-Mean Parameter Box shows the Delta Mean velocity of the Doppler spectra. The Delta Mean velocity is a similar calculation to the standard Mean Velocity but this box is displayed as a percent of a standard value. By using the Set Delta Mean function, the 100% level for the Delta Mean box is taken from the present Mean value. After this time, the Delta Mean parameter box will display a percent value relative to this level which essentially displays the change in the mean velocity with respect to the point in time where the Set Delta Mean was used.

See ***Setting the Remote Control S1 - S5 key functions*** in *Chapter S5*.

Note: If both envelope curves are switched off for a particular record, the system will display and print a "-" for all envelope related values.

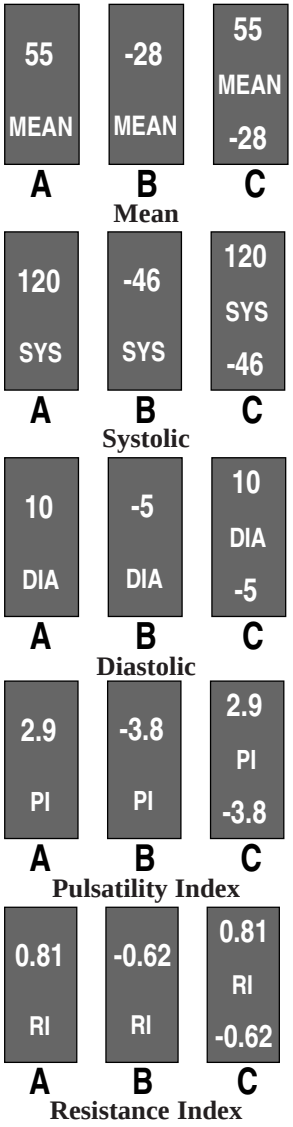


Figure 1: The possible measurement results you can choose to view.
(A) = Flow toward the transducer.
(B) = Flow away from the transducer.
(C) = Flow in both directions.

Reading the intensity scale

Note that to the right of the Doppler window is a column divided into 64 colored segments with Black at the bottom and Red at the top (Figure 1).

These colors represent the signal intensity in units of dB. The higher the color in the scale, the more red blood cells there are flowing at that particular velocity. You can obtain a visual interpretation of the Doppler signals intensity by comparing the colors of the signal with the intensity scale colors.

For example, bright red could correspond to an intensity of 33 dB or more; bright yellow corresponds to an intensity of 14 dB, and black to an intensity of 9 dB or less.

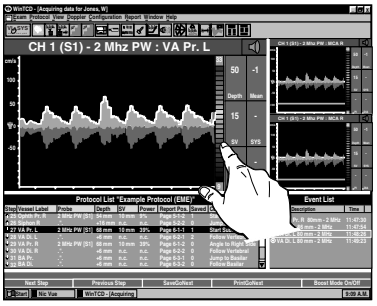


Figure 1: The intensity scale colors represent the signal intensity ranging from black (lower dB value) to red (upper dB value).

Adjusting the intensity scale

You can adjust the intensity scale of the spectral display at any time to better match the type of signal by using one of the two methods below. There are six possible ranges available for the intensity scale.

Weak Doppler signals should use a smaller spectral display range (difference between top and bottom intensity values). Strong Doppler signals should use a larger spectral display range. Noisy Doppler signals are best displayed with the lower intensity value being larger.

Method 1

1. If one of the S-keys at the bottom of the screen display is assigned the **Display Range** function, click on the button or press the corresponding **S-key** on the remote control to toggle through the six ranges.

Method 2

1. Click on **Doppler** and then on **Display Range** to toggle through the six ranges (Figure 2).

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Curve Recording	
SoundTrak	
Boost Mode	Ctrl+Alt+F
Flow Separation	
Squelch	
Noise Reduction	
Link Channels in MD Mode	
Filter Up	Shift+F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Monitoring Mode

Doppler

Save Spectral Snapshot	F1
Freeze Spectral Snapshot	F2
Print Spectral Window	Ctrl+P
Toggle PW/CW	
Probe	F10
SoundTrak	
Boost Mode	
Flow Separation	Ctrl+Alt+F
Squelch	
Noise Reduction	
HFE Mode	Ctrl+H
Filter Up	Shift F9
Filter Down	Ctrl+F9
Vessel Labels	
Parameter Boxes	
Spectra	F9
Envelope	F6
Units	F8
Display Range	
Set Delta Mean	Ctrl+D

Diagnostic Mode

Figure 2: Click on Display Range.

Note: In the freeze and review windows, the gain key adjusts the software gain setting which shifts the signal strength up and down the color scale to allow fine adjustments in a post processing mode. The dB values in the color scale are adjusted appropriately.

Mon. Only Turning Curve recordings on/off - *Monitoring Mode only*

Note: Curve recording is available in the Monitoring Mode only.

Curve recordings capture Envelope and Trend data only. To turn Curve recordings on or off, use any of the following methods.

Method A

1. Click on the **Curve Recording on/off** button.

Method B

1. Click on **Doppler** and then on **Curve Recording** (Figure 1).

Method C

1. If one of the softkeys at the bottom of the screen display is assigned the **Curve Recording On/Off** function, either click on that softkey or press the corresponding soft key (**S1 - S5**) on the Remote Control.

To set the softkey functions, see *Set the Remote Control S1-S5 key functions* in *Chapter S5*.

Intermittent Curve recordings

You can set up the system to record Curve data at predetermined intervals automatically. This feature helps reduce the size of your Curve data files.

1. Click on **Configuration** (Figure 2).
2. Click on **Intermittent Curve Recording**.
3. Select how long a duration you want recordings to last (Figure 3).
4. Select how long you want the system to wait between recordings.
5. Click on **OK**. The system automatically begins the intermittent recordings and ***Curve Recording (Auto)*** is entered in the Event List.

Turning Intermittent Curve recordings off

1. If the system is in the recording interval, click on the **Curve Recording on/off** button.

Curve recording off appears in the Event List.
2. If the system is in the nonrecording interval, click on the **Curve Recording on/off** button two times.

Curve recording on and then ***Curve recording off*** appear in the Event List.

Note: When Curve saving is on, all curves for each channel are saved, not just those displayed. In the Review mode, the other curves can be configured for display and then they will appear.

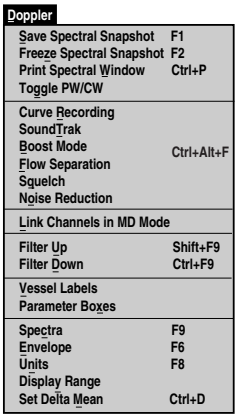


Figure 1: Click on Doppler and then on Curve Recording.

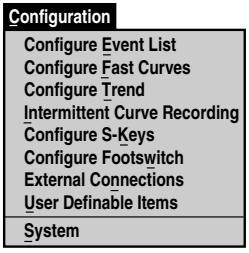


Figure 2: Click on Configuration and then on Intermittent Curve Recording.

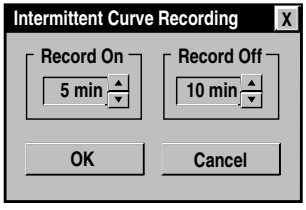


Figure 3: Select how long recordings should last and how long recordings should be turned off. Click on OK when finished.

Mon. Only Enabling the indicator - *Monitoring Mode only*

Note: The indicator algorithm is available in the Monitoring Mode only and only if a valid software license (Advanced H.I.T.S. Indication) is installed in the system.

H.I.T.S. is an acronym which stands for High Intensity Transient Signals. These include emboli and various types of artifacts (e.g., patient movement, transducer movement, environmental noise, etc.). The user is responsible for determining whether a H.I.T.S. is an embolus or an artifact.

You can enable/disable the indicator algorithm using any of the three methods. When enabled, the system automatically saves a Spectral Snapshot (Figure 1) when a H.I.T.S. occurs.

Each H.I.T.S. event in the Spectral display is marked with a small tick mark and label.

Note: Depending on the country of distribution, the term H.I.T.S. may be replaced in the menus by the word Emboli.

Method 1

1. Click on **Indicators** (Figure 2).
2. Click on **Enable** (Figure 3).
3. Go to the next page.

Method 2

1. Click on the **Indicators On/Off** button (Figure 4).
2. Go to the next page.

Method 3

1. Click on the **Indicators On/Off** softkey (if assigned) or press the corresponding **S-key** on the Remote Control.
2. Go to the next page.

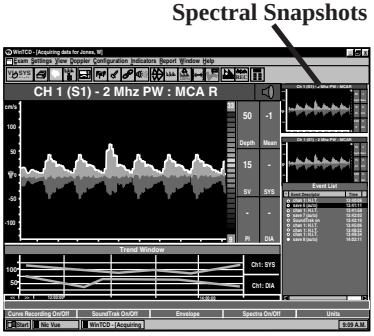


Figure 1: Spectral Snapshots are saved automatically each time a high intensity transient signal is detected and the Indicator algorithm is enabled.

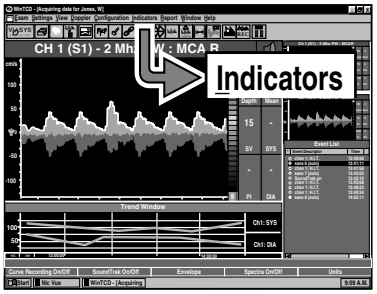


Figure 2: Click on Indicators.

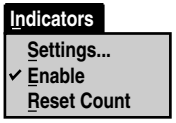


Figure 3: Click on Enable. A checkmark means it is currently enabled.

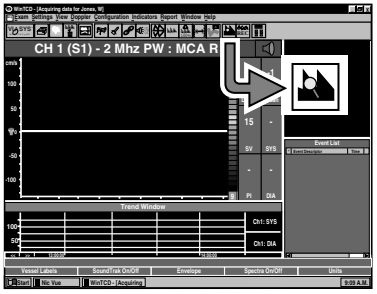


Figure 4: Click on the Indicators On/Off button to enable/disable detection. Detection is enabled when the button appears pressed in.

Configuring the Indicators settings

The indicator algorithm settings can be configured in the **Indicators Settings** menu. The percent confidence levels for both H.I.T.S. and artifacts can be set to values between 10 and 100%. These values are a form of threshold in determining which events to save. All events, which are detected, and have a confidence level higher than the configured level will be saved. The 100% level represents OFF since no events can be detected with 100% confidence.

In addition the channels can be selected where the detection algorithm should run by using one of the combo boxes (representing the probe sockets) in the menu (Two provided for Companion III and four for the Pioneer TC8080).

To activate the **Indicators Settings** menu (Figure 3):

1. Click on **Indicators** (Figure 1) and click on **Settings** (Figure 2).

- or -

1. If one of the softkeys at the bottom of the screen display is assigned the **Indicators Settings** function, either click on that softkey or press the corresponding soft key (**S1 - S5**) on the Remote Control.

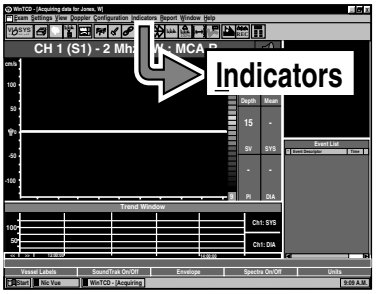


Figure 1: Click on Indicators.

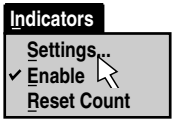


Figure 2: Click on Settings.

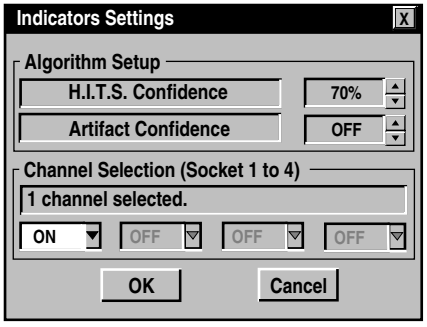


Figure 3: Click on the Confidence Up/Down keys until desired setting appears and/or select the channel(s) where the algorithm should be active.

Note: The indicator algorithm is not designed to be used with bidirectional signals. For best results try to optimize the signal strength above the zero line.

Note: For more information concerning the use of the indicator algorithm please refer to the special writeup "Manual of Doppler Embolic Signal Detection".

Resetting the H.I.T.S. counter

The H.I.T.S. counter counts the number of H.I.T.S. occurrences and displays that number in the H.I.T.S. counter box (Figure 1). This box can be reset to 0 at any time by using one of the methods below.

Note: In the Multichannel Mode, each Spectral display can have its own counter.

1. Click on **Indicators** (Figure 2).
2. Click on **Reset Count** (Figure 3) to reset the counter to zero.

- or -

1. Click on the **Indicators Reset Count** softkey (if assigned) or press the corresponding **S-key** on the Remote control.

Note: Depending on the country of distribution, the term H.I.T.S. may be replaced by the word Emboli.

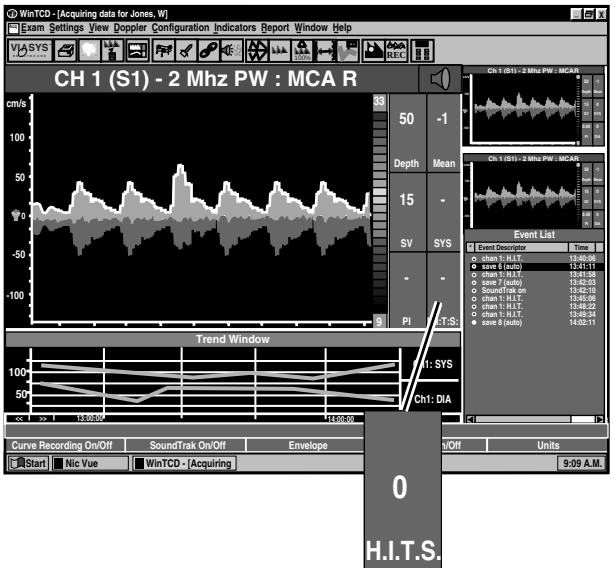


Figure 1: When the H.I.T.S. Parameter box is enabled and the Indicator algorithm is turned on (previous page), the number of detected H.I.T.S is displayed in the H.I.T.S. box.

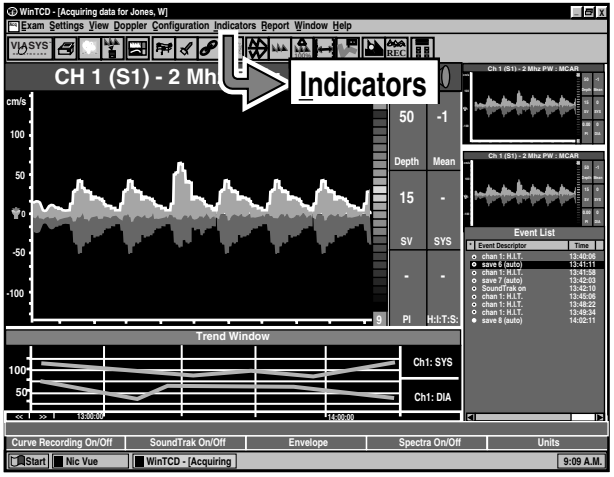


Figure 2: Click on Indicators.

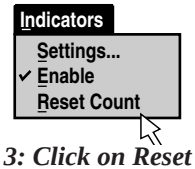


Figure 3: Click on Reset Count.

Mon. Only Saving Event Markers - *Monitoring Mode only*

There are two types of user defined event markers which are supported in the WinTCD software package. The first type of marker is intended for interval events (I-Markers). These events are start / stop type markers which describe events that happen over an interval of time. The second type of marker is intended for single events (S-Markers). These events are one shot markers which describe events that only happen at one moment in time.

Markers can be saved during the acquire mode by using one of the two methods described on this page. Method 1 should be used to save markers at the current point in time. Method 2 should be used to save markers at a time position in the past.

The set markers will be drawn in the curve displays at the correct time position using the color light green and these will also be added to the event list. The real time markers receive the time position corresponding to the point in time when the s-key was pressed and not the time when the marker was finally selected.

Method 1

1. Click on the **S-Marker** or **I-Marker** softkey (if assigned) or press the corresponding **S-key** on the Remote Control.

2. Select the appropriate marker out of the list (Figure 1) using the mouse or use the up/down arrow keys to select the label and press enter to save it.

Method 2

1. Position the mouse pointer (it will change to a crosshair) inside the Trend window at the point in time where the marker should be set (Figure 2) and then click the **Right** mouse button.

2. Select either **Insert S-Marker** or **Insert I-Marker** out of the menu (Figure 3).

3. Select the appropriate marker out of the list (Figure 1) using the mouse or use the up/down arrow keys to select the label and press enter to save it.

Note: Refer to section S5 in this manual for information on configuring the S-Marker and I-Marker lists.

Custom Marker
Injection
Diamox
Biting
Sneeze
Embolus
Artifact
Probe Bump

Custom Marker	
Hyperventilation	Start
Hyperventilation	Stop
Sleep	Begin
Sleep	End
X-Clamp	On
X-Clamp	Off

Figure 1: Event marker lists.

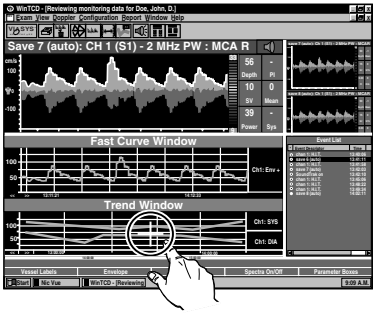


Figure 2: Right click inside the Trend window.

Insert S-Marker ▶
Insert I-Marker ▶
Edit Event
Delete Event

Figure 3: Right click Trend window menu (lower section).

Mon. Only Working With Event Markers - *Monitoring Mode only*

Saving Custom Markers

At any point, when one of the event marker lists is on the screen, the user has the option to enter a custom marker by selecting this choice from the list. Custom markers are to be used for unexpected events which have not been preconfigured in the lists. When **Custom Marker** is selected a pop up menu will appear (Figure 1) allowing the user to type in a custom name and/or marker state. Once a custom marker has been saved, it will appear in the list for the remainder of the examination to allow it to be used more than once.

Editing Event Markers

It is possible to edit any saved user defined event in the event list by right clicking on the event and selecting **Edit Event** out of the menu (Figure 2). An edit marker list will appear (Figure 3) from which the user can choose a different marker or use the **Edit Marker** function to enter a custom marker name.

It is also possible to edit any saved user defined event by right clicking on the event in a curve window (Figure 4) and selecting **Edit Event** out of the menu (Figure 5).

Deleting Event Markers

It is possible to delete any saved user defined event in the event list by highlighting the event and pressing the delete key or right clicking on the event and selecting **Delete Event** out of the menu (Figure 2). After a prompt for confirmation, the event is deleted permanently from the list and the curve windows.

It is also possible to delete any saved user defined event by right clicking on the event in a curve window (Figure 4) and selecting **Delete Event** out of the menu (Figure 5).

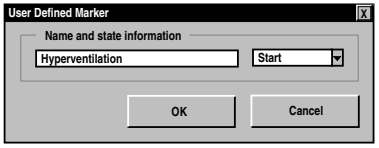


Figure 1: User Defined marker dialog.

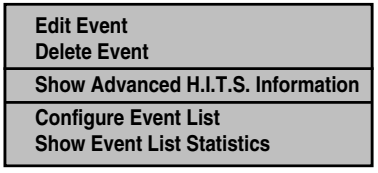


Figure 2: Right Click Event List Menu.

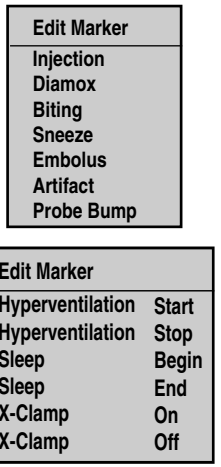


Figure 3: Edit marker lists.

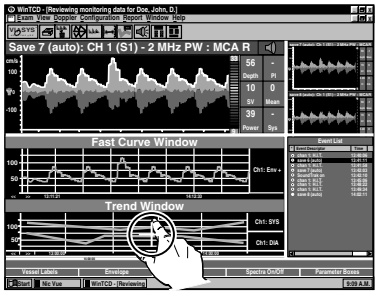


Figure 4: Right click on the saved event in the Trend window.

Figure 5: Right click Trend window menu (lower section).

Diag. Only Using Protocols - Diagnostic Mode only

You can choose any of the previously created Protocols for use during a Diagnostic exam. A Protocol is comprised of numerous steps which can help improve your efficiency while performing a Diagnostic exam.

See *Chapter S6* for instructions on creating/editing Protocols and choosing a Default Protocol. Additional information about Protocols can also be found in *Chapter S10*.

Loading a Protocol

The Protocol Manager panel lets you choose from a list of Protocols that can be quickly loaded onto the system for immediate use.

Note: When the Diagnostic Acquisition mode is selected, the system loads the Default Protocol automatically. If the Default Protocol is the one you want to use, you can skip to the next page.

1. Click on the **Protocol Manager** button.

   - or -

   Click on **Protocol** (Figure 1) and then click on **Protocol Manager**.

2. Either click on the desired **Protocol** and then click on **Load** or double-click on the **Protocol** you want to load (Figure 2).

   The **Diamond** symbol identifies the current default protocol and the right pointing **Arrow** identifies which protocol is currently loaded on the system.

3. Go to the next page.

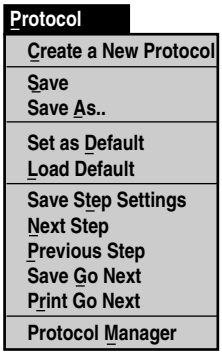


Figure 1: Click on Protocol and then on Protocol Manager.

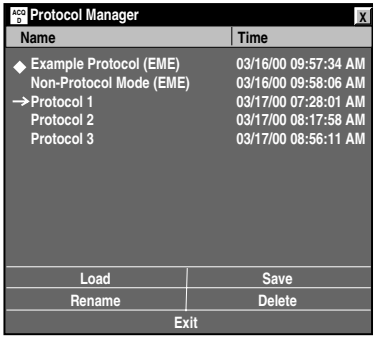


Figure 2: Click on (highlight) the desired Protocol and then click on Load or just double-click on the desired Protocol.

Stepping through a Protocol

Once the desired Protocol is loaded, you can begin the exam. The first step is selected automatically when the Protocol is loaded.

There are several ways of stepping through a Protocol:

Load the next/previous step

You can use either of these methods to step forward (step backward) through the list of Protocol steps. The newly selected step will become the Active step and the system will load all the configuration points specified by that step.

Method A

1. If one of the softkeys has been assigned the **Next Step** (**Previous Step**) function, click on that button or press the corresponding S-key on the Remote Control.

Method B

1. Click on **Protocol** (Figure 1).
2. Click on **Next Step** (**Previous Step**).

Method C

1. Click on either the **Previous Step** or **Next Step** buttons.

Save active spectral display and load the next step

You can instruct the system to save the active spectral display and then advance to the next step using either of these methods. The Saved column will change from 0 to 1 (Figure 2).

Method A

1. If one of the softkeys has been assigned the **Save Go Next** function, click on that button or press the corresponding S-key on the Remote Control.

Method B

1. Click on **Protocol** (Figure 1).
2. Click on **Save Go Next**.

Method C

1. Click on the **Save Go Next** button.

Print active spectral display and load the next step

You can instruct the system to print a hardcopy of the active spectral display and then advance to the next step using either of these methods. The Report Print positions are ignored for these types of hardcopies.

Method A

1. If one of the softkeys has been assigned the **Print Go Next** function, click on that button or press the corresponding S-key on the Remote Control.

Method B

1. Click on **Protocol** (Figure 1).
2. Click on **Print Go Next**.

Note: It is recommended that you use the Graphics Report printout instead of the Print Go Next command to produce a more compact report.

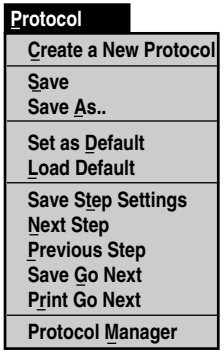


Figure 1: The Protocol menu.

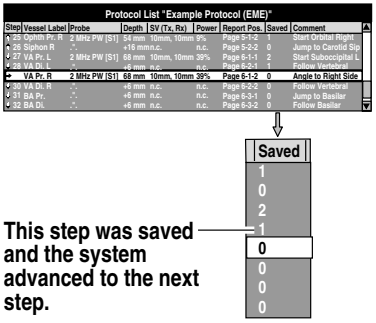

Protocol List "Example Protocol (EME)"
Step Vessel Label Probe Depth SV (Tx, Rx) Power Report Pos. Saved Comment
25 Ophth Pr. R 2 MHz PW [S1] 54 mm 10mm, 10mm 9% Page 5-1-2 1 Start Orbital Right
26 Siphon R +16 mm n.c. n.c. Page 5-2-2 0 Jump to Carotid Sip
27 VA Pr. L 2 MHz PW [S1] 68 mm 10mm, 10mm 39% Page 6-1-1 2 Start Suboccipital L
28 VA Pr. L 68 mm 10mm 39% Page 6-2-1 1 Follow Vertebral
VA Pr. R 2 MHz PW [S1] 68 mm 10mm, 10mm 39% Page 6-1-2 0 Angle to Right Side
30 VA Di. R +6 mm n.c. n.c. Page 6-2-2 0 Follow Vertebral
31 BA Pr. +6 mm n.c. n.c. Page 6-3-1 0 Jump to Basilar
32 BA Di. +6 mm n.c. n.c. Page 6-3-2 0 Follow Basilar
Saved
1
0
2
1
0
0
0
0
This step was saved and the system advanced to the next step.

Figure 2: The Saved field for the Active step will increment by 1 each time you execute the Save Go Next command or the Save command.

Loading a step manually

You can load any step in the list rather the loading the next or previous step using any of these methods. This feature lets you return to and reload a step or bypass several steps. See the examples in Figures 1 and 2.

Method A

1. Press the **Up/Down Arrow** keys on the Remote Control until the desired step is highlighted in blue.

2. Press the **Enter** button. The selected step is now the active step.

Method B

1. Press the **Up/Down Arrow** keys on the keyboard until the desired step is highlighted in blue.

2. Press the **Enter** button. The selected step is now the active step.

Method C

1. **Double-click** on the desired step. The selected step is now the active step.

Protocol List "Example Protocol (EME)"

Step	Vessel Label	Probe	Depth	SV (Tx, Rx)	Power	Report Pos.	Saved	Comment
25	Ophth Pr. R	2 MHz PW [S1]	54 mm	10mm, 10mm	9%	Page 5-1-2	1	Start Orbital Right
26	Siphon R	."	+16 mm	n.c.	n.c.	Page 5-2-2	0	Jump to Carotid Sip
27	VA Pr. L	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-1	1	Start Suboccipital L
28	VA Di. L	."	+6 mm	n.c.	n.c.	Page 6-2-1	2	Follow Vertebral
→	VA Pr. R	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-2	0	Angle to Right Side
30	VA Di. R	."	+6 mm	n.c.	n.c.	Page 6-2-2	0	Follow Vertebral
31	BA Pr.	."	+6 mm	n.c.	n.c.	Page 6-3-1	0	Jump to Basilar
32	BA Di.	."	+6 mm	n.c.	n.c.	Page 6-3-2	0	Follow Basilar

Figure 1: The blue highlight was moved up two steps by pressing the Up Arrow button twice.

Protocol List "Example Protocol (EME)"

Step	Vessel Label	Probe	Depth	SV (Tx, Rx)	Power	Report Pos.	Saved	Comment
25	Ophth Pr. R	2 MHz PW [S1]	54 mm	10mm, 10mm	9%	Page 5-1-2	1	Start Orbital Right
26	Siphon R	."	+16 mm	n.c.	n.c.	Page 5-2-2	0	Jump to Carotid Sip
→ 27	VA Pr. L	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-1	1	Start Suboccipital L
28	VA Di. L	."	+6 mm	n.c.	n.c.	Page 6-2-1	2	Follow Vertebral
29	VA Pr. R	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-2	0	Angle to Right Side
30	VA Di. R	."	+6 mm	n.c.	n.c.	Page 6-2-2	0	Follow Vertebral
31	BA Pr.	."	+6 mm	n.c.	n.c.	Page 6-3-1	0	Jump to Basilar
32	BA Di.	."	+6 mm	n.c.	n.c.	Page 6-3-2	0	Follow Basilar

Figure 2: After pressing the Enter key, the step that was selected in Figure 1 became the Active step.

Blank Page

Chapter S8
Reviewing the Data

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This chapter describes how to review data which was collected during an exam.

- **Saved Spectra Snapshots.**
- **Trend Data.**
- **Fast Curve Data.**
- **H.I.T.S. Data.**
- **Continuous SoundTrak Data.**

Note: Some information in this chapter applies to reviewing Monitoring data only. These topics will be identified with the **Mon. Only** flag shown in the legend below. Likewise, subjects that apply only to Diagnostic data will be identified with the **Dia. Only** flag. Also, for subjects that apply to both the Diagnostic and Monitoring Review modes, one or the other will be used for the illustrations. Both will be shown only if necessary for clarity.

If you need help using the keyboard commands (**Alt**+**letter**), see *Chapter S2* in this guide.

Legends

Diag. Only — Designates Diagnostic Mode only.

Mon. Only — Designates Monitoring Mode only.

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Start the program and open a file for review

The WinTCD program must be installed on your system before the program can be started.

A summary of steps for the NicVue is included on this page. If you need additional help, please refer to the ***NicVue Reference Guide*** that accompanied this guide for instructions on starting the WinTCD application and opening a data file.

Note: Depending on the version of NicVue, which is installed on the system, the icons may vary. For older systems, the icons should be displayed as shown below in Figure 4.

Figure 4: Older NicVue Icons.

Summary of steps

1. Using the Left mouse button, double-click on the **NicVue icon** (Figure 1).

2. From the NicVue window, locate and click on the patient record in which the data files you want to review are located and then click on the data file you want to review.

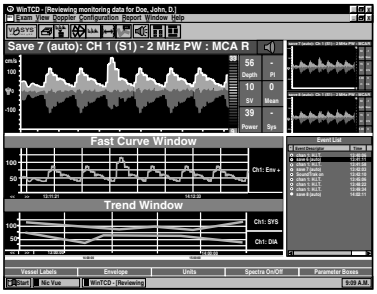
3. From the NicVue window, click on the **Review** button (Figure 2).

4. When the WinTCD window appears (Figure 3), continue with the next page.

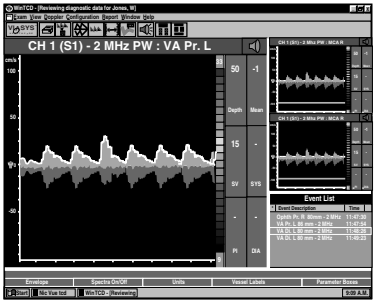
If a file, containing an M-Mode display, is selected, please refer to *Chapter S16* in this guide for all the details on using the M-Mode display.

Figure 1: From the Desktop, double-click on the NicVue icon.

Figure 2: From the NicVue screen, click on the Review button.



Monitoring Review Mode



Diagnostic Review Mode

Figure 3: When a screen display similar to that above appears, continue with the next page.

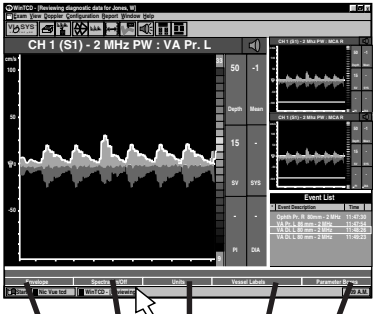
Set the Remote Control S1 - S5 key functions

You can select, from a menu of options, the functions of the five keys (S1 - S5) on the Remote Control (Figure 1). These five keys allow you to quickly execute the chosen function by simply pressing the corresponding key (S1 - S5) on the Remote Control or by clicking on the displayed softkey.

Example
If, for example, the S1 key is currently assigned to the Vessel label list function and you want to change it to *Units*, use the Right mouse key and click on the *Vessel Labels* softkey and then click on *Units* from the options menu. The first softkey (S1) will now read *Units* and pressing the **S1** key on the Remote Control will alternate the Flow Velocity Scale between **cm/s** and **kHz**.

Note: A function can not be assigned to more than one key at a time.

1. Position the mouse pointer over the **softkey** displayed towards the bottom of the Review window (Figure 2).
2. Click the **Right** mouse button.
3. Click on the function you want to assign to the selected softkey (Figure 3).
4. Repeat until all five S-keys have been assigned a specific function.



These 5 keys correspond to the 5 softkeys on the screen display.

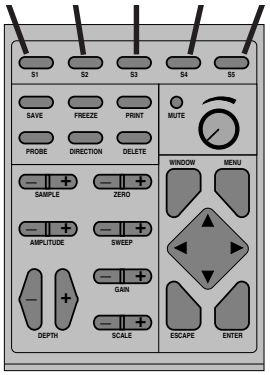


Figure 1: The softkeys displayed on the screen can be clicked on to execute the action or the corresponding S-key on the remote control can be pressed to execute the action.

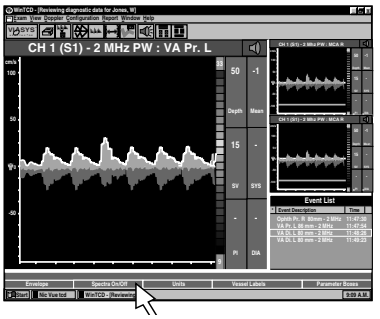


Figure 2: Position the mouse pointer over the displayed softkey you want to define and then click the Right mouse button.

Envelope
Spectra On/Off
Units
Vessel Labels
Text Report
Graphics Report
Parameter Boxes
SoundTrak Display
Export SoundTrak
M-Mode Display Options
Display Range
Play SoundTrak
Calculate VMR (H Cursors)
Calculate VMR (A Cursors)
Recal. Values (2 Cursors)
Recal. Values (3 Cursors)
HFE Breakpoint
Noise Reduction
Fast Curve Window

Review Mode

Figure 3: Click on the function you want to assign to the selected key.

Reviewing saved spectral snapshots

Note: The examples in this section mostly use the Diagnostic Review screen displays. The same principles also apply for the Monitoring Review screens.

To select saved data for viewing:

Method A

1. Double-click on the **snapshot** you want to view (Figure 1).

Method B

1. Double-click on the desired event in the Event List (Figure 2).

Mon. Only Method C

1. Double-click on the desired event (vertical event marker text near the top of the trend window) displayed on the Monitoring Review Mode Trend Window (Figure 3).

Method D

1. Use the **Arrow** keys to select a snapshot in the Event List and then press the **Enter** key.

Note: The ordering (sorting) of the event list can be changed by clicking on one of the column headers under its title bar.

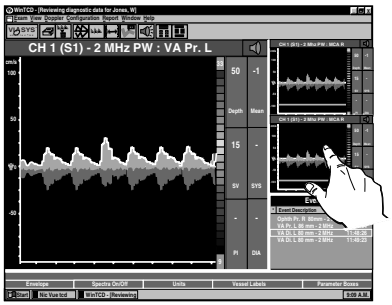


Figure 1: Double-click on the saved spectral snapshot.

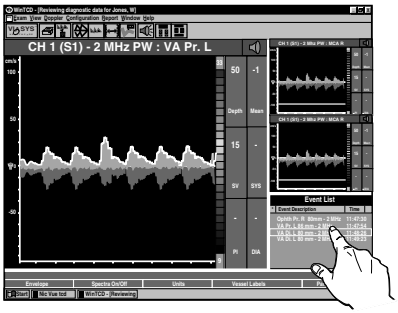


Figure 2: Double-click on the event in the Event List.

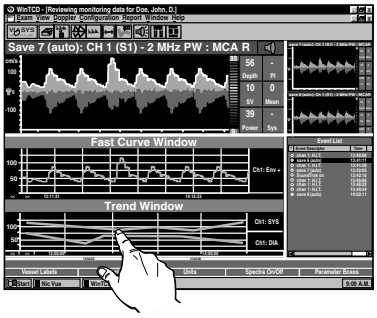


Figure 3: Double-click on the event in the Trend Window.

Note: If the review functions are used in the acquire mode, the post processing will occur in a pop up review window. This window needs to be focussed for correct operation.

Resizing the windows

You can increase the size of the various boxes/windows to increase the display area for improved viewing.

1. To better view the Spectra and measured values, increase the window to fill the entire screen by clicking on the **Maximize** button (Figure 1).

2. To improve your view, you can increase the size of the Spectral window, Trend window, or Fast Curve window, by clicking and holding down the mouse button on the **Splitter Bar** (Figure 2) and then dragging the mouse until the desired window size is reached.

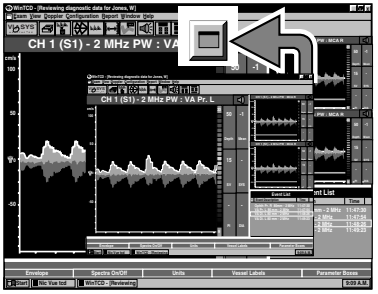
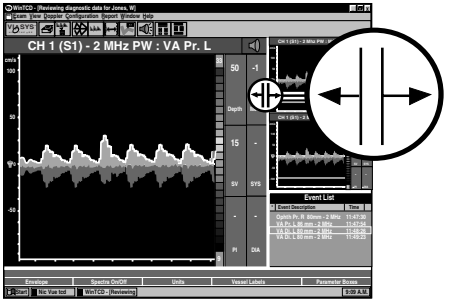
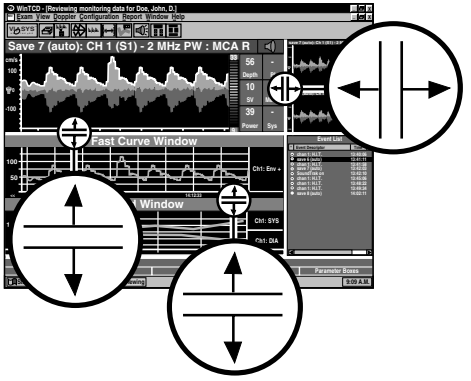


Figure 1: Click on the Maximize button.



Diagnostic Review Mode



Monitoring Review Mode

Figure 2: Examples of some Splitter bars which allow you to resize a window.

Using the General Cursor Mode (Spectral Displays)

In order to set cursors in the spectral display windows, the user must activate a special cursor mode. Inside of the General Cursor mode, there are five types of cursors available for the spectral displays. These are Horizontal Velocity, Vertical Time, Dual Crosshair, Differential Velocity, and Differential Time. The following pages describe these.

Note: The General Cursor Mode is only available in the freeze and review spectral display windows. It is not available in the real-time sweeping spectral display window.

Note: When multichannel spectral records are present, the General Cursor Mode must be activated on an individual channel basis.

Activating the General Cursor Mode

The General Cursor Mode for the spectral displays can be switched on by:

1. Right clicking in the spectral display window.
2. Clicking on the function **General Cursors** (Figure 1).

Recognizing the General Cursor Mode

When the General Cursor Mode for a spectral display window is active, the mouse pointer will change into a special cursor type pointer when the mouse is positioned in the data section of the spectral display window. Depending on the type of cursor active, a different mouse pointer (Figure 2) will be active.

Selecting the Cursor Type

The type of cursor can be selected by:

1. Right clicking in the spectral display window.
2. Clicking on the function **Select Cursor Type** (Figure 3).
3. Selecting the cursor type from the submenu. (Figure 4).

Deactivating the General Cursor Mode

The General Cursor Mode for the spectral displays can be switched off by:

1. Right clicking in the spectral display window.
2. Clicking on the function **General Cursors Off** (Figure 3).

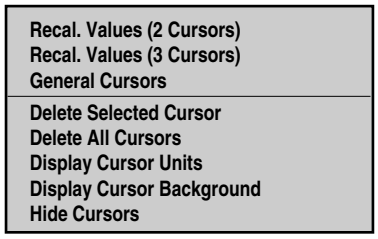


Figure 1: Spectral Window Right Click Menu.

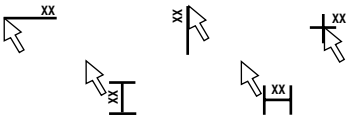


Figure 2: Various Spectral Cursor Mouse Pointers.

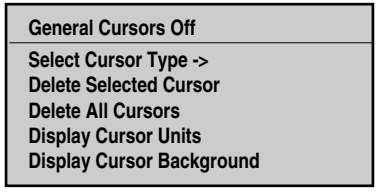


Figure 3: General Cursor Mode Right Click Menu.

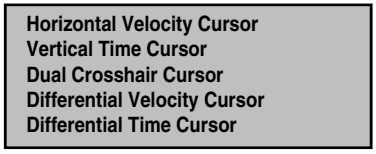


Figure 4: Cursor Type Menu.

Note: See also the sections on **Recalculating Values** which follow the General Cursor Mode sections for information on a special type of cursor mode which allows the automatically calculated Mean, Sys, Dia, PI, and RI values in the parameter boxes to be manually calculated by setting horizontal cursors.

Setting Horizontal Velocity Cursors

Horizontal Velocity cursors are single line measurements which are made with respect to the V=0 reference (Figure 1).

The Spectral Horizontal Velocity cursors may be set to measure the velocity value from any point on the spectra by:

Method A

1. Selecting the Horizontal Velocity cursor type (as described previously) to get the appropriate mouse pointer.

2. Positioning the mouse pointer on the point of interest and then clicking the **Left** mouse button.

Method B

1. Selecting the Horizontal Velocity cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking and holding down the **Left** mouse button anywhere in the spectral data, then dragging the horizontal cursor line to a new position, and releasing the mouse button on the point of interest.

The line is drawn and the velocity with respect to V=0 is displayed (Figure 2).

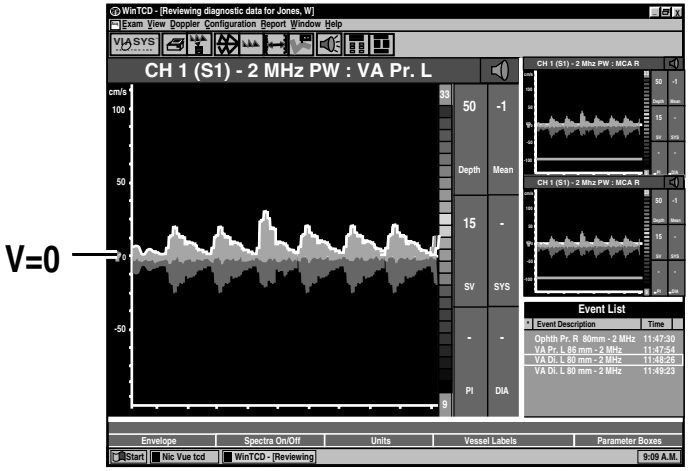


Figure 1: Horizontal Velocity cursor measurements are made with respect to the Velocity = 0 reference.

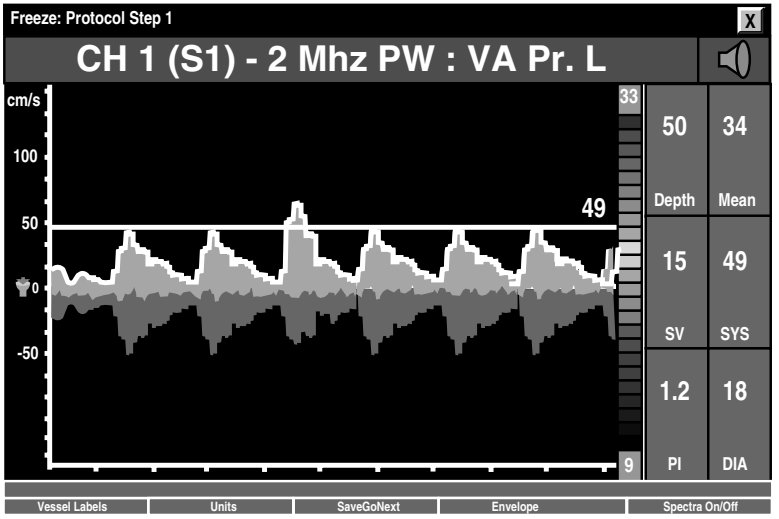


Figure 2: This example shows a single Horizontal Velocity cursor.

Note: Up to ten cursor measurements can be saved in a single spectral display window. If you make more than ten measurements, the oldest measurement will be removed from the display.

Setting Vertical Time Cursors

Vertical Time cursors are single line measurements which are made with respect to the T=0 reference (Figure 1).

The Spectral Vertical Time cursors may be set to measure the time value in ms from any point on the spectra by:

Method A

1. Selecting the Vertical Time cursor type (as described previously) to get the appropriate mouse pointer.

2. Positioning the mouse pointer on the point of interest and then clicking the **Left** mouse button.

Method B

1. Selecting the Vertical Time cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking and holding down the **Left** mouse button anywhere in the spectral data, then dragging the vertical cursor line to a new position, and releasing the mouse button on the point of interest.

The line is drawn and the time with respect to T=0 is displayed (Figure 2).

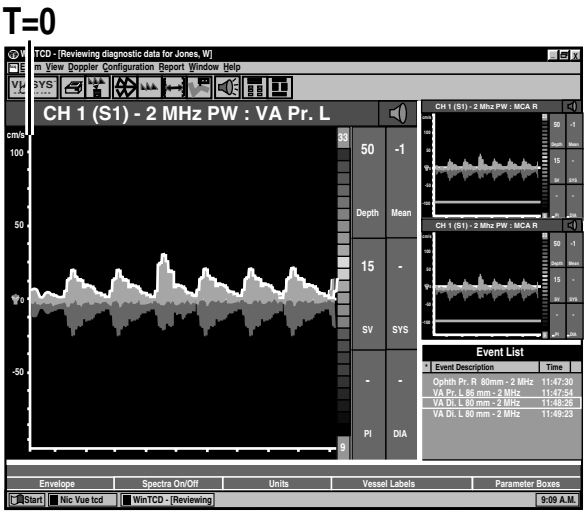


Figure 1: Vertical Time cursor measurements are made with respect to the Time = 0 reference.

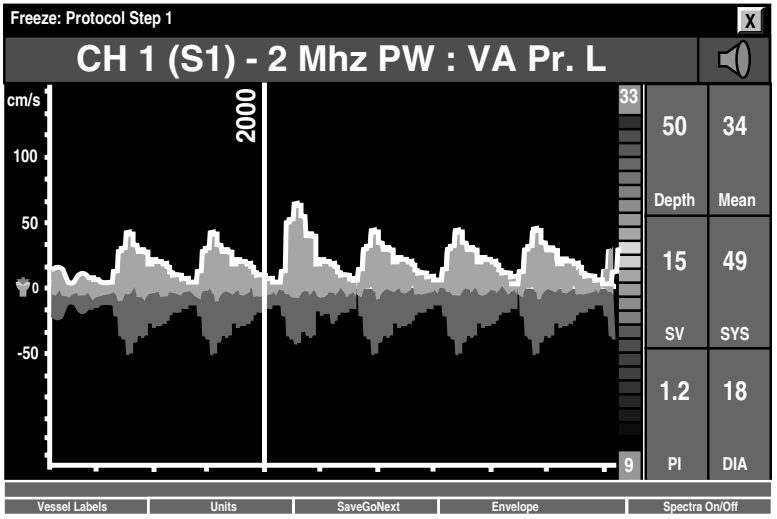


Figure 2: This example shows a single Vertical Time cursor.

Setting Dual Crosshair Cursors

Dual Crosshair cursors are single point measurements which are made with respect to the T=0 and V=0 references (Figure 1).

The Spectral Dual Crosshair cursors may be set to measure the time and velocity values from any point on the spectra by:

1. Selecting the Dual Crosshair cursor type (as described previously) to get the appropriate mouse pointer.

2. Positioning the mouse pointer on the point of interest and then clicking the **Left** mouse button.

The time with respect to T=0 and velocity with respect to V=0 are displayed and the selected point is marked with a + (Figure 2).

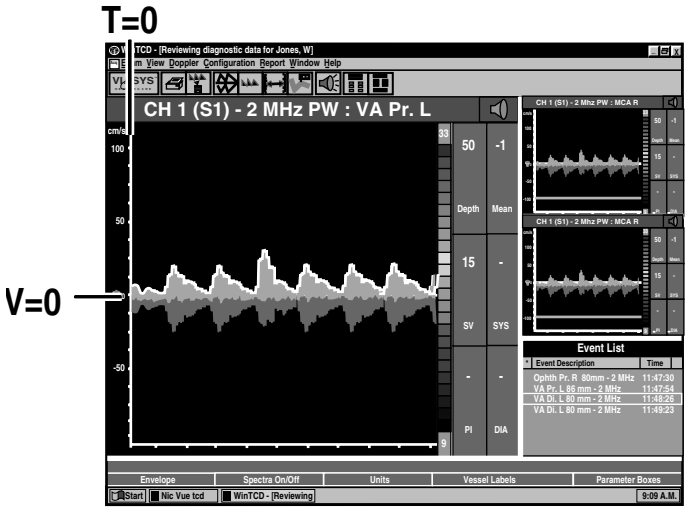


Figure 1: Single point measurements are made with respect to the Time = 0 and Velocity = 0 references.

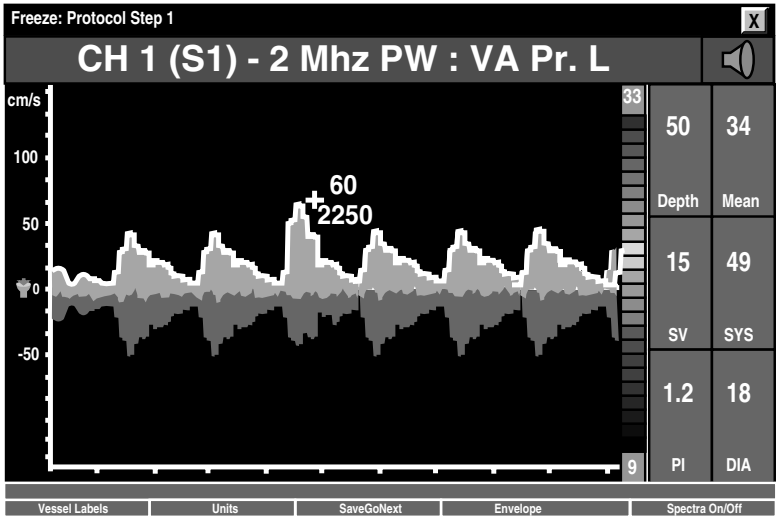


Figure 2: This example shows a single point measurement.

Setting Differential Velocity Cursors

Differential Velocity cursors are single value cursors which measure the velocity difference between any two points on the Spectra. This method is very useful when making peak-to-peak measurements.

The Spectral Differential Velocity cursors may be set to measure the relative velocity difference between any two points on the Spectra by:

1. Selecting the Differential Velocity cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking on the first of **two points** you want to measure and then holding down the Left mouse button (Figure 1).

3. Dragging the mouse until the highlighted box is over the second point and then releasing the mouse button (Figure 1).

A sideways H-**Bar**' appears between the two points and the differential velocity (V1 - V2) value is displayed (Figure 2).

Figure 1: Click on the first point and hold down the mouse button while dragging the cursor over the second point and then release the mouse button.

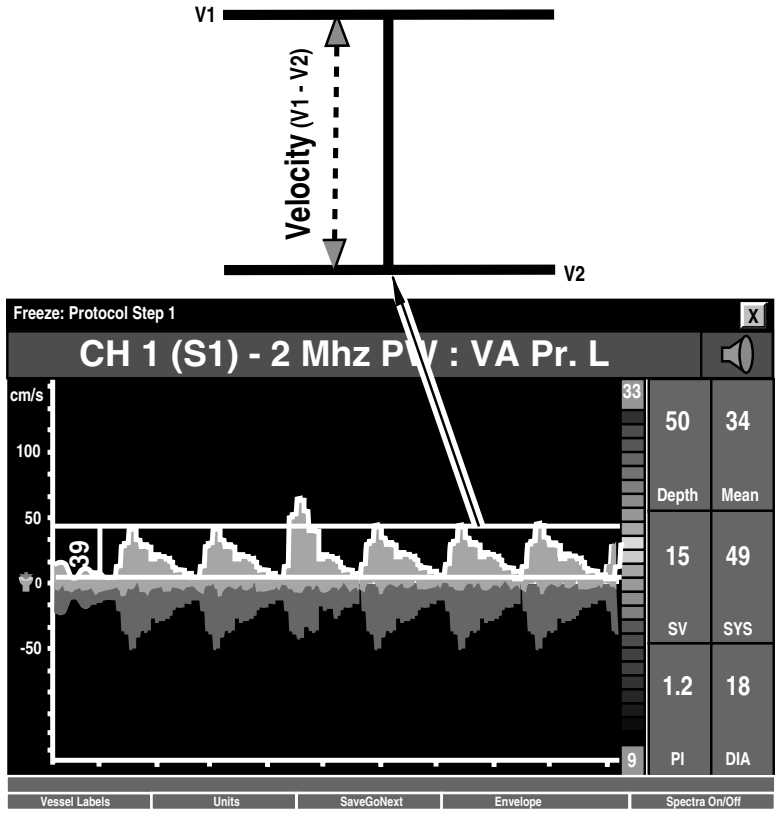


Figure 2: This example illustrates a differential velocity cursor.

Setting Differential Time Cursors

Differential Time cursors are single value cursors which measure the time difference between any two points on the Spectra. This method is very useful when making duration measurements.

The Spectral Differential Time cursors may be set to measure the relative time difference between any two points on the Spectra by:

1. Selecting the Differential Time cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking on the first of **two points** you want to measure and then holding down the Left mouse button (Figure 1).

3. Dragging the mouse until the highlighted box is over the second point and then releasing the mouse button (Figure 1).

An H-**Bar**' appears between the two points and the differential time (T2 - T1) value is displayed (Figure 2).

Figure 1: Click on the first point and hold down the mouse button while dragging the cursor over the second point and then release the mouse button.

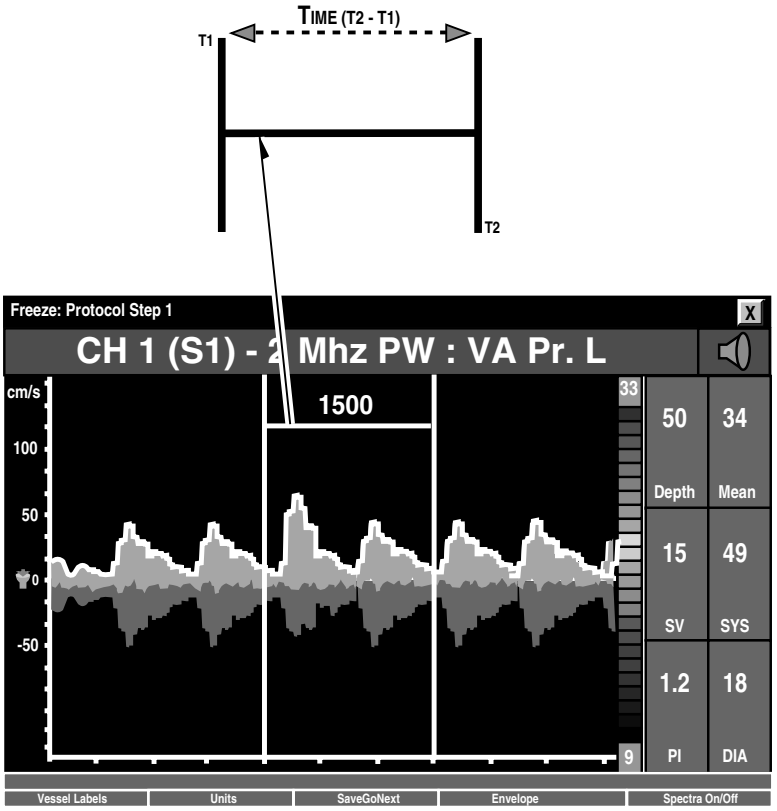


Figure 2: This example illustrates a differential time cursor.

Working With Spectral Cursors

This section describes the various functions which are available to edit the different types of spectral cursors.

Note: Up to ten cursor measurements can be saved in a single spectral display window. If you make more than ten measurements, the oldest measurement will be removed from the display.

Moving Cursors

All the different types of spectral cursors may be moved by clicking the left mouse button on a cursor, holding down the button and dragging the cursor to a new position, and then releasing the button.

Resizing Cursors

The differential spectral cursors may be resized by first single clicking the left mouse button on a cursor to activate it and then clicking the mouse on one of the small resize handles (half way up the boundary lines), holding down the button, dragging the boundary line to a new position, and then releasing the button.

Deleting Individual Cursors

All the different types of spectral cursors may be deleted by first single clicking the left mouse button on a cursor to activate it and then pressing the delete key or right clicking the mouse on the cursor and then selecting **Delete Selected Cursor** from the menu.

Deleting All Cursors

All the spectral cursors, irregardless of their type, may be deleted all at once from a spectral record by right clicking the mouse anywhere in the spectral display data and then selecting **Delete All Cursors** from the menu.

Saving Cursors

The cursors may be saved by simply resaving the spectral record.

Displaying Cursor Units

The units (cm/sec, msec, etc.) for all of the spectral cursor types may be toggled on for a spectral record by right clicking the mouse anywhere in the spectral display data and then selecting **Display Cursor Units** from the menu. The units may be toggled off by right clicking the mouse anywhere in the spectral display data and then selecting **Remove Cursor Units** from the menu.

Clearing Cursor Background

At times the cursor values may be difficult to read if the numbers are written directly over the spectral data. For this reason it is possible to clear the background data for the cursor value by right clicking the mouse anywhere in the spectral display data and then selecting **Clear Cursor Background** from the menu. The background may be toggled back on by right clicking the mouse anywhere in the spectral display data and then selecting **Display Cursor Background** from the menu.

Hiding Cursors

All the different types of spectral cursors may be temporarily removed from the display by right clicking the mouse anywhere in the spectral display data and then selecting **Hide Cursors** from the menu. The cursors may be toggled back on by right clicking the mouse anywhere in the spectral display data and then selecting **Show Cursors** from the menu.

Note: The **Hide Cursors** and **Show Cursors** functions are only available when the General Cursor Mode is switched off.

Manually Recalculating Values

In cases where the signal quality is so poor that the envelope curve cannot properly follow the signal, the WinTCD software has the ability to allow the automatically calculated Mean, Systolic, Diastolic, PI, and RI values to be overridden and replaced with manually recalculated values by setting horizontal cursors in the spectral displays.

There are two generally accepted methods to accomplish this task. The more popular method, *Recalculate Values (3 Cursors)*, is based on manually setting three horizontal cursors on one side of the zero line (one for the systolic velocity, one for the mean velocity, and one for the diastolic velocity). The other method *Recalculate Values (2 Cursors)* is based on manually setting two horizontal cursors on one side of the zero line (one for the systolic velocity and one for the diastolic velocity). In this case, the mean value is calculated mathematically.

The following sections describe the special user modes, which are similar to the General Cursor mode with Horizontal Velocity cursors, to allow manual recalculations of the parameter values using either of the above methods in a spectral display window.

Activating the Recalculate Values Mode

The Recalculate Values Mode for the spectral displays can be switched on by:

Method A

1. Right clicking in the spectral display window.

2. Clicking on either function **Recal. Values (2 Cursors)** or **Recal. Values (3 Cursors)** (Figure 1).

Method B

1. Clicking on one of the s-keys **Recal. Values (2 Cursors)** or **Recal. Values (3 Cursors).**

Recognizing the Recalculate Values Mode

When the Recalculate Values Mode for a spectral display window is active, the mouse pointer will change into a special cursor type pointer (Horizontal Velocity) when the mouse is positioned in the data section of the spectral display window. (Figure 2).

In addition to the mouse pointer changing, the spectral display will be redrawn with the envelope curves switched off.

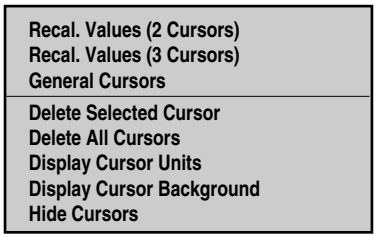


Figure 1: Spectral Window Right Click Menu.

Figure 2: Recalculate Values Spectral Cursor Mouse Pointer.

Finally the parameter boxes for the values will switch to the color green to indicate manually calculated values. See Figure on next page.

Note: The Manual Recalculation Modes are only available in the freeze and review spectral display windows. They are not available in the real-time sweeping spectral display window.

Note: When multichannel spectral records are present, the Manual Recalculation Mode must be activated on an individual channel basis.

Using the Recalculate Values (2 Cursors) Mode

This section explains how Horizontal Velocity cursors may be used to allow manual recalculations of the parameter values using the Recalculate Values (2 Cursors) mode.

Once the Recalculate Values (2 Cursors) mode is activated, it is possible to set two cursors (or four in the case where above and below the zero line measurements are needed) in the spectral display window in a similar way to the general cursor mode explained previously.

While the Recalculate Values (2 Cursors) mode is active, the system constantly inspects the spectral display to see if 2 valid Horizontal Velocity cursors (all on the same side of the zero line) have been set. Other types of cursors are ignored.

As soon as two valid Horizontal Velocity cursors are found on one or both sides of the zero line, the system sets the systolic velocity measurement(s) equal to the largest cursor value(s) and the system sets the diastolic velocity measurement(s) equal to the lowest cursor value(s). The mean velocity measurement is calculated according to the formula (Mean = 1/3 Systole + 2/3 Diastole). Once these values are set, the system recalculates the PI and RI values accordingly as shown in Figure 1.

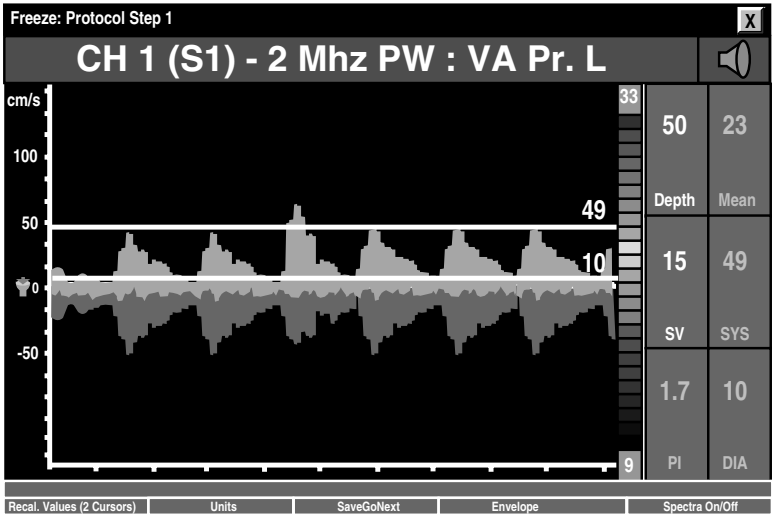


Figure 1: Recalculating Values using two Horizontal Velocity cursors.

If the user tries to set more than two Horizontal Velocity cursors on one side of the zero line, then the system automatically moves the closest cursor to the new position.

The Recalculate Values (2 Cursors) mode always interprets any cursor changes and automatically recalculates new values. e.g. Toward and away values are shown when the correct number of Horizontal Velocity cursors are set on both sides of the zero line, values are removed if cursors are deleted, values are recalculated if a cursor position is moved, etc.

During the time that the system does not have the correct number of cursors, the parameter box values are displayed as - with the color green.

Note: The cursor values and the resulting PI and RI values are subject to rounding errors at times. The values used in the formulas are often of higher precision than those of the displayed cursor values which are rounded off.

Note: For information on how to set Horizontal Curve cursors, please refer to the section *Setting Horizontal Curve Cursors*.

Using the Recalculate Values (3 Cursors) Mode

This section explains how Horizontal Velocity cursors may be used to allow manual recalculations of the parameter values using the Recalculate Values (3 Cursors) mode.

Once the Recalculate Values (3 Cursors) mode is activated, it is possible to set three cursors (or six in the case where above and below the zero line measurements are needed) in the spectral display window in a similar way to the general cursor mode explained previously.

While the Recalculate Values (3 Cursors) mode is active, the system constantly inspects the spectral display to see if 3 valid Horizontal Velocity cursors (all on the same side of the zero line) have been set. Other types of cursors are ignored.

As soon as three valid Horizontal Velocity cursors are found on one or both sides of the zero line, the system sets the systolic velocity measurement(s) equal to the largest cursor value(s), the system sets the mean velocity measurement(s) equal to the middle cursor value(s), and the system sets the diastolic velocity measurement(s) equal to the lowest cursor value(s). Once these values are set, the system recalculates the PI and RI values accordingly as shown in Figure 1.

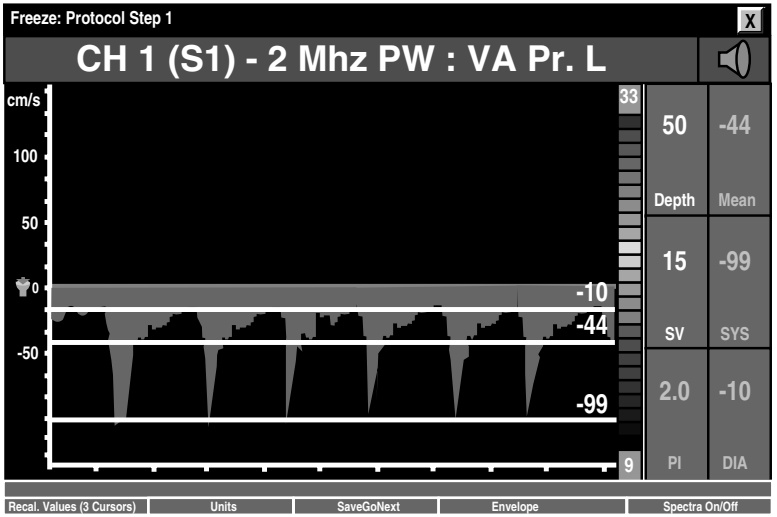


Figure 1: Recalculating Values using three Horizontal Velocity cursors.

If the user tries to set more than three Horizontal Velocity cursors on one side of the zero line, then the system automatically moves the closest cursor to the new position.

The Recalculate Values (3 Cursors) mode always interprets any cursor changes and automatically recalculates new values. e.g. Toward and away values are shown when the correct number of Horizontal Velocity cursors are set on both sides of the zero line, values are removed if cursors are deleted, values are recalculated if a cursor position is moved, etc.

During the time that the system does not have the correct number of cursors, the parameter box values are displayed as - with the color green.

Note: The cursor values and the resulting PI and RI values are subject to rounding errors at times. The values used in the formulas are often of higher precision than those of the displayed cursor values which are rounded off.

Note: For information on how to set Horizontal Curve cursors, please refer to the section *Setting Horizontal Curve Cursors*.

Saving Recalculated Values

The recalculated values and associated cursors may be saved by simply resaving the spectral record.

It is not necessary to exit the Recalculation mode after saving the values.

In the case that the recalculation is done in the freeze window, saving will automatically close the window. If the screen is frozen again, the recalculation mode will not be active.

In the case that the recalculation is done in the pop up review window, saving will not automatically close the window or turn off the recalculation mode. The window needs to be closed in the standard way by clicking on the **X** symbol. If the pop up review window is opened again, the recalculation mode will no longer be active.

In the case that the recalculation is done in the standard review window, saving will not turn off the recalculation mode. If another record is read in, the recalculation mode will no longer be active.

If a record has been manually recalculated, and the user would like to turn the automatic envelope curve calculation back on, the user should refer to the following two methods.

Deactivating the Recalculate Values (2 Cursors) Mode

The Recalculate Values (2 Cursors) Mode for the spectral display can be switched off by:

Method A

1. Right clicking in the spectral display window.
2. Clicking on the function **Recal. Values (2 Cursors) Off** (Figure 1).

Method B

1. Clicking on the s-key function **Recal. Values (2 Cursors).**

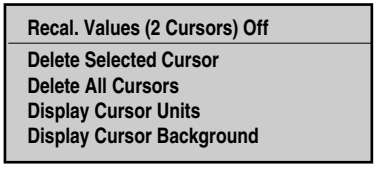


Figure 1: Recalculate Values (2 Cursors) Mode Right Click Menu.

Deactivating the Recalculate Values (3 Cursors) Mode

The Recalculate Values (3 Cursors) Mode for the spectral display can be switched off by:

Method A

1. Right clicking in the spectral display window.
2. Clicking on the function **Recal. Values (3 Cursors) Off** (Figure 2).

Method B

1. Clicking on the s-key function **Recal. Values (3 Cursors).**

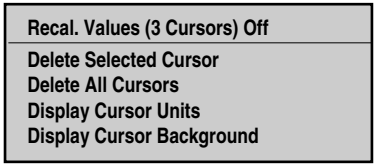


Figure 2: Recalculate Values (3 Cursors) Mode Right Click Menu.

Deleting a Spectral snapshot

If you no longer need a Spectral snapshot, it can be deleted from the hard drive.

! CAUTION

Deleted Spectral snapshots cannot be recovered after they have been deleted. Make sure you select the correct snapshot before it is deleted.

Method 1

1. Using the Right mouse button, click in either the **Copy Window** or the **Event List** on the **Spectral snapshot** you want to delete (Figure 1).

2. Click on **Delete Event** (Figure 2).

3. Click on **OK** (Figure 3).

Method 2

1. In the Event List, click on (highlight) the **record** you want to delete (Figure 1) and then press the Delete key on the Remote Control.

2. Click on **OK** (Figure 3).

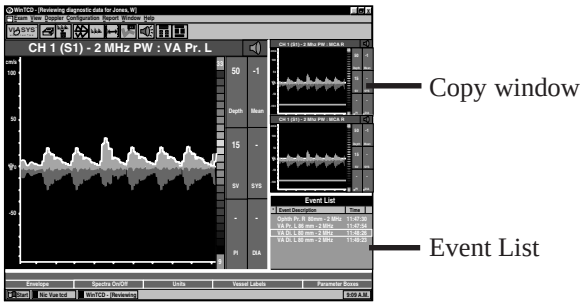


Figure 1: Click on the Snapshot or Event you want to delete.

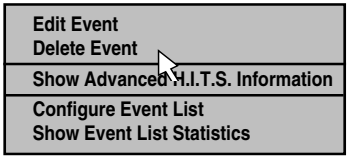


Figure 2: Click on Delete Event.

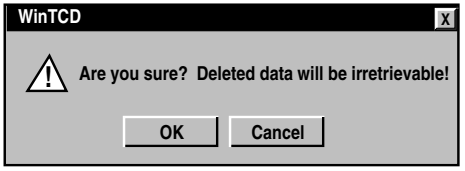


Figure 3: Click on OK.

Editing a Spectral snapshot

This function has the same effect as post-processing which allows you to change the gain, zero line, vessel label, and direction as well as adding time and velocity measurements to the snapshot.

1. Using the Right mouse button, click on the **Spectral snapshot** in the Copy Window or Event List you want to edit (Figure 1).

2. Click on **Edit Event** (Figure 2).

3. Edit and perform the measurements as desired.

4. Continue with one of the following methods.

Note: Spectral Snapshots can also be edited whenever they are loaded for review in both the acquire-review mode and the true review mode. Refer to Chapter S7 of this manual for a description of the post processing functions.

Method 1

1. Press the **F1** key on your keyboard or the **Save** key on your remote control to store your changes to the snapshot. Alternatively you can click on **Doppler** and then on **Save Spectral Snapshot** or click on the **Save Snapshot** button.

Method 2

1. Double-click on the next **snapshot** you want to edit. You will be asked if you want to save the changes you made to the edited snapshot. Click on **Yes** (Figure 3).

Method 3

1. In the Event List, double-click (or click on and then press **Enter**) on the **event** you want to edit (Figure 4). You will be asked if you want to save the changes you made to the edited snapshot. Click on **Yes** (Figure 3).

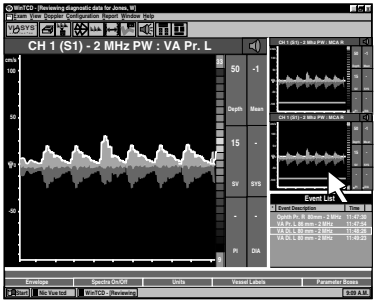


Figure 1: Right click on the Snapshot you want to edit.

Figure 2: Click Edit Event.

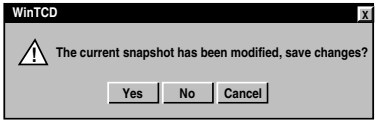


Figure 3: If you used method 2, click on Yes when the above query appears on the screen display.

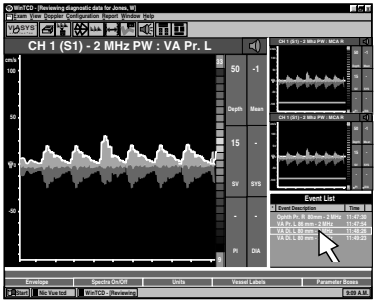


Figure 4: Double-click on the desired event.

Replaying SoundTrak data

If spectral snapshots are saved with the SoundTrak function turned on, then the audio data (for the spectral sweep) can be listened to in the post processing mode. Each time a spectral snapshot is read in, the SoundTrak data will be played back and a sweeping line will indicate the position in the spectral display.

In order to replay the SoundTrak data for a particular record, use one of the following methods:

1. Click on the **Play SoundTrak** button.

2. Click on **Doppler** and then on **Play SoundTrak** (Figure 1).

3. Using the Right mouse button, click on one of the speaker symbols for a spectral display to get the menu as shown in Figure 2 and then choose one of the **Replay SoundTrak** options. In multichannel modes you have the choice to listen to one channel individually or all channels together.

Note: If Continuous SoundTrak data has been saved for the examination, please refer to the next sections for a description how to postprocess this data.

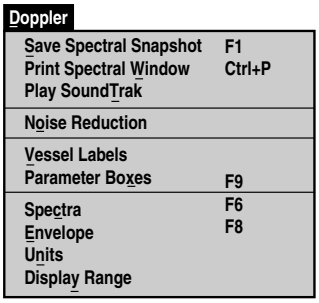


Figure 1: Select Doppler and then Play SoundTrak to listen to the Doppler audio signal saved along with the spectral data.

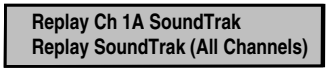


Figure 2: Select the appropriate choice to listen to either all channels together or one channel individually.

Mon. Only Reviewing Continuous SoundTrak Data

The continuous SoundTrak feature, which is only supported in the monitoring mode, is unique and provides the user with the ability to reanalyse entire monitoring sessions in a thorough, methodical manner, and is particularly useful for event detection. When all of the SoundTrak data for a complete examination is available, a significant amount of new possibilities become available in the review mode and the need for an external DAT recorder is eliminated.

Once a patient file, which contains continuous SoundTrak data, has been read into the review mode, the only difference the user initially sees is the addition of the Continuous SoundTrak Toolbar as shown in Figure 1. If continuous SoundTrak data is present, the Continuous SoundTrak Toolbar is placed under the normal review mode toolbar.

The seven CD player control symbols displayed in the left side of the Continuous SoundTrak Toolbar are used to control the playback of the continuous SoundTrak data. These functions are explained in the following sections.

The light blue color line drawn between the CD player symbols and the current time graphically represents the complete length of the recording. The left end of the line is the exam start time. The right end of the line is the exam end time. A square tab position indicator is placed above this line. This indicator points to the present file position and slowly moves to the right during the playback process. If the continuous SoundTrak data file is segmented, since it was recorded using intermittent monitoring, the line is drawn in segments. The light blue color is used for areas containing data and gray is used for areas not containing data.

The current time of the spectral display window is displayed at the far right side of the Continuous SoundTrak Toolbar. In the case of a static saved spectral display record, the save time of the record (representing the end time of the sweep) is displayed. This corresponds with the event list time entry. In the case that the spectral display window is playing back continuous SoundTrak data, then the current data time is displayed and incremented every millisecond.

Note: For more information concerning the creation of Continuous SoundTrak data, please refer to sections S9, S16, and S17 in this guide.

Figure 1: Continuous SoundTrak Toolbar.

Replaying Continuous SoundTrak Data

At any point during the review session, the user is able to start the playback of the continuous SoundTrak data by clicking on the **play** symbol (third from left) in the Continuous SoundTrak Toolbar. The starting point of the playback is the time shown in the Continuous SoundTrak Toolbar. The data from this part of the file is then read out and the Doppler parameters are displayed in the parameter boxes (Figure 2). The FFT(s) are recalculated causing the spectral displays to start sweeping from the left side of the display. The audio is heard just like in the original acquire mode. The spectral title bar changes to remove the Save label creating a look just like in the original acquire mode.

The time display in the Continuous SoundTrak Toolbar shows the actual recording time of the data.

While continuous SoundTrak data is being played back, a blue play symbol appears next to the speaker symbols in a similar way to the green arrow which is used in the normal external audio playback mode.

As the system sweeps, each time the Doppler parameters change in the recorded file, the screen is updated with the new values as if a movie was made of the original examination.

Figure 1: Continuous SoundTrak Toolbar.

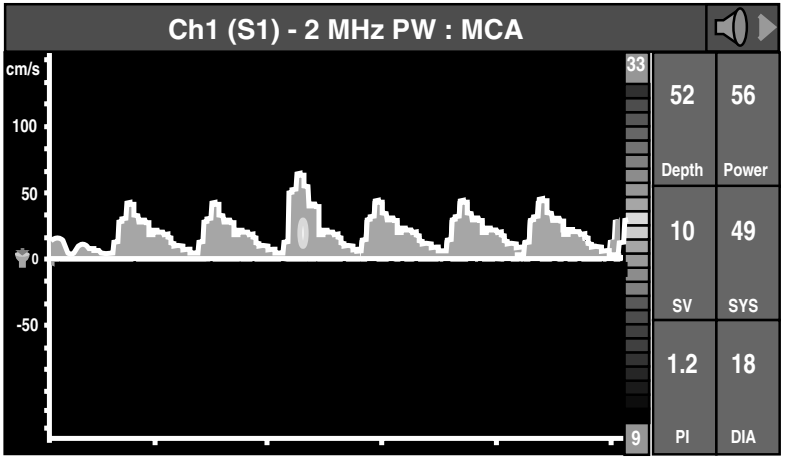


Figure 2: Continuous SoundTrak Playback Spectral Display.

Note: While continuous SoundTrak data is being played back, if the system encounters a Doppler adjustment event (like a depth setting change, etc.), the audio sound will be briefly muted to removed the popping sound as is done in the acquire mode. This can be confusing during playback since no keys are being pressed, but the system has recorded all of the original adjustments and recalls these at the appropriate times.

Note: While continuous SoundTrak data is being played back, if the system encounters the end of a data saving segment (Recording Stop marker), the playback stops at that point.

Note: An important clarification to mention is that the curve data is not regenerated even if the examination is played back with a different software gain setting.

Altering Display Parameters During Continuous SoundTrak Playback

While continuous SoundTrak data is playing back, the equivalent playback mode Doppler functions (Software gain, sweep, zero line, direction, audio volume, etc.) are all available. The other Doppler functions are not available since the data has already been created. If these functions are pressed by the user, they get messages displayed saying that they are not available during continuous SoundTrak playback.

Use the **Gain** key on the remote control to shift the signal strength up and down the color scale to obtain a more clearly defined spectrum. You may also use **Ctrl + F4** to lower or **Shift + F4** to raise the gain on the screen display. The dB values in the color scale are adjusted appropriately. Set the gain so that the envelope curve closely outlines the Doppler waveform.

Use the **Zero** key on the remote control to shift the zero baseline towards the top or bottom of the window. You may also use **Ctrl + F3** to lower or **Shift + F3** to raise the zero baseline on the screen display.

Use the **Sweep** key on the remote control to adjust the time scale of the horizontal axis in the Doppler window. You may also use **Ctrl + F8** to decrease or **Shift + F8** to increase the sweep speed.

Use the **Direction** key on the remote control to change the displayed blood flow direction. You may also use the **F4** key on the keyboard or simply click on the **Blood Flow icon** itself. When the **arrow is red**, blood flow above the zero line is toward the transducer. When the **arrow is blue**, blood flow above the zero line is away from the transducer.

Use the **Volume knob** on the remote control to adjust the Audio volume for the running spectral displays. You may also use **Ctrl + F7** to decrease or **Shift + F7** to increase the volume level.

Use the **Noise Reduction** icon to toggle the electronics for the noise reduction in the audio signal. When the noise reduction is On (button shown as pressed), the background hiss will be removed from the sound. When the function is toggled Off (button shown as not pressed), the electronics for the noise reduction are switched off - allowing the background hiss. This function can also be toggled using the menu point or the s-key.

Note: The Noise Reduction toggle is only available in the systems containing a PCI Board Type 2. Refer to the About menu to determine the board type.

Note: Other display parameters like vessel labels, envelopes, units, display range, parameter boxes, spectra on/off, and M-Mode display adjustments can also be made. Please refer to the sections in this maual explaining these functions for the normal acquire mode. The continuous SoundTrak playback mode is essentially the same.

Note: While reviewing Continuous SoundTrak data, user adjustments to the display like the software gain or M-Mode window scale size, etc. are all maintained until these are changed or a record is read in which has different settings.

Adjusting the Time Position for Continuous SoundTrak Playback

The user can adjust the playback time position for the continuous SoundTrak data in a very similar way like using a DAT recorder.

The user is able to page the playback of the data forward by clicking on the **page (>)** symbol. In this case, the data being heard and shown in the spectral windows temporarily stops and the time position in the Continuous SoundTrak Toolbar is incremented by one full spectral sweep. The system then clears out the spectral window and starts sweeping from the new time position. If the spectral window is not sweeping when the page forward button is pressed, it just increments the time counter by one full spectral sweep but does not automatically start sweeping again.

The user is able to page the playback of the data backward by clicking on the **page (<)** symbol. In this case, the data being heard and shown in the spectral windows temporarily stops and the time position in the Continuous SoundTrak Toolbar is decremented by one full spectral sweep. The system then clears out the spectral window and starts sweeping from the new time position. If the spectral window is not sweeping when the page backward button is pressed, it just decrements the time counter by one full spectral sweep but does not automatically start sweeping again.

The user is able to fast forward the playback of the data by clicking on the **fast forward (>>)** symbol. In this case, the data being heard and shown in the spectral windows stops and the time position in the Continuous SoundTrak Toolbar starts incrementing at a faster rate. By pressing stop or the fast forward button again, the fast forwarding is stopped. If play is then pressed, the system starts playing back from the new time position. If the spectral window is not sweeping when the fast forward button is pressed, it stops at the new time position. If the spectral window is sweeping when the fast forward button is pressed, it continues playing back at the new time position.

The user is able to rewind the playback of the data by clicking on the **rewind (<<)** symbol. In this case, the data being heard and shown in the spectral windows stops and the time position in the Continuous SoundTrak Toolbar starts decrementing at a faster rate. By pressing stop or the rewind button again, the rewinding is stopped. If play is then pressed, the system starts playing back from the new time position. If the spectral window is not sweeping when the rewind button is pressed, it stops at the new time position. If the spectral window is sweeping when the rewind button is pressed, it continues playing back at the new time position.

While continuous SoundTrak data is playing back, the user is able to pause the playback of the data by clicking on the **pause** symbol (fourth from left). The transfer of the continuous SoundTrak data then stops and the time position in the Continuous SoundTrak Toolbar stops incrementing. The spectral displays stop sweeping and remain in this state until the user selects another function.

Note: The CD player symbols are grayed out when the functions are not available. Depending on the situation different combinations of functions are grayed out. e.g. When the time position is at the end of the file, the fast forward, play, and page forward functions are not available.

Jumping the Time Position for Continuous SoundTrak Playback

The user can also jump the playback time position for the continuous SoundTrak data to a different part of the examination.

By clicking the left mouse button on the position indicator tab over the blue time line (Figure 1), holding and dragging this symbol to a new position, the user is able to jump to any position in the continuous SoundTrak data file. This procedure temporarily stops the continuous SoundTrak playback mode and restarts it from the new time position. If the system was not playing back, then just the time indicator is altered. If the continuous SoundTrak data file is segmented and the user moves the indicator to a gray area not containing data, the system always jumps to the next position which has data.

By recalling any event out of the event list or trend display, the user is able to jump to any position in the continuous SoundTrak data file. This procedure stops the continuous SoundTrak playback mode and recalls one sweep of spectral and audio data from this time position if a spectral record was recalled. If the event was not a spectral record, then the system just jumps to the new time position and continues in the same mode either playing back or in pause mode.

Note: If a spectral record, which was saved at a time, when the curve data saving was turned off, is read in, then the continuous SoundTrak functionality should be temporarily disabled.

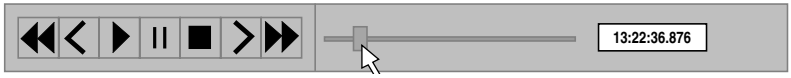


Figure 1: Continuous SoundTrak Toolbar.

Postprocessing Continuous SoundTrak Data

While continuous SoundTrak data is playing back, the user is able to stop the playback of the data by clicking on the **stop** symbol or by using the **Freeze** function. The transfer of the continuous SoundTrak data then stops and the time position in the Continuous SoundTrak Toolbar stops incrementing. The spectral displays freeze but not in a pop up window like in the acquire mode. At this point, the standard post processing functionality is all available like in the standard review mode. The user is even able to save to get an additional saved spectral record by pressing save.

By pressing the play symbol or by unfreezing, the user is able to restart the playback of the data. The transfer of the continuous SoundTrak data then starts again with the time position in the Continuous SoundTrak Toolbar.

While continuous SoundTrak data is being played back, the user is able to save additional spectral records to the file by using the standard Save function. A spectral record is written to the copy window and a new entry is added to the event list and curve windows at the appropriate time point. The event is labeled **RSAVE** (manual) for review save and numbered beginning with the number 1 so there are no numbering conflicts with the original saves.

Mon. Only Reviewing H.I.T.S. data

This section describes how to review the H.I.T.S. data that was collected during the Monitoring acquisition mode.

Note: The procedures in this section of the chapter are for the Monitoring Mode only, not the Diagnostic Mode.

H.I.T.S. events are labeled in the spectral display snapshots by a small white tick at the top of the display which indicates their position. Near to the event a text marker is drawn with an **E** or an **A** and then a number to indicate which number event or artifact. These numbers correspond with the numbers in the event list.

Turning the Labeling text off

The event labeling text can be switched on and off by:

1. Right clicking on the event in the spectral display and selecting **Display H.I.T.S. Text On/Off** (Figure 1).

Note: Depending on the country of distribution, the term H.I.T.S. may be replaced in the menus by the word Emboli.

Viewing the Advanced H.I.T.S. Information

The advanced H.I.T.S. information contains the values of the different parameters in the indicator algorithm. To view the information:

1. Right click on the event in the spectral display and select **Show Advanced H.I.T.S. Information** (Figure 2). The information is displayed in a pop up window (Figure 3).

2. Right click on the event in the event list and select **Show Advanced H.I.T.S. Information** (Figure 4). The information is displayed in a pop up window (Figure 3).

Show Event List Statistics

A statistical listing of the H.I.T.S. events is available. To view:

1. Right click on the event list and select **Show Event List Statistics** (Figure 4). The information is displayed in a pop up window (Figure 5).

Note: For more information concerning the algorithm parameters please refer to the special writeup "Manual of Doppler Embolic Signal Detection".

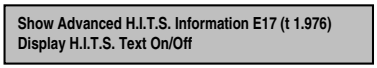


Figure 1: Right click on the event and select Display H.I.T.S. Text On/Off.

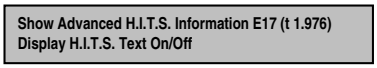


Figure 2: Right click on the event in the spectral display and select Show Advanced H.I.T.S. Information.

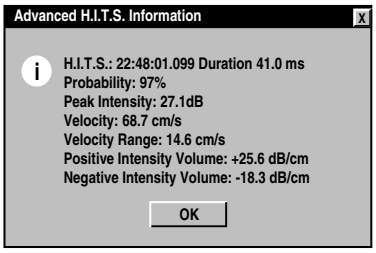


Figure 3: Advanced H.I.T.S. Information window.

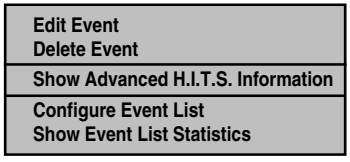


Figure 4: Right click on the event in the event list and select Show Advanced H.I.T.S. Information.

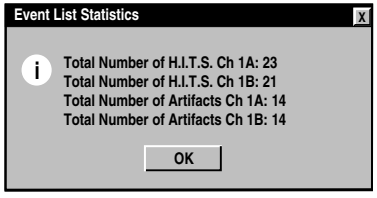

Event List Statistics
X
i
Total Number of H.I.T.S. Ch 1A: 23
Total Number of H.I.T.S. Ch 1B: 21
Total Number of Artifacts Ch 1A: 14
Total Number of Artifacts Ch 1B: 14
OK

Figure 5: Event List Statistics Information window.

The SoundTrak Display

This section describes how to review the SoundTrak audio data which can be saved together with the spectral snapshot data.

Note: The SoundTrak window is available in the Review mode only for both Diagnostic and Monitoring exams. It is mainly intended to be used to see time delay information with multidepth H.I.T.S. events.

Activating the SoundTrak display

The SoundTrak display (Figure 1) can be switched on and off by:

1. Left clicking on the softkey labeled **SoundTrak Display**.

2. Pressing the softkey **(S1-S5)** labeled **SoundTrak Display**.

When the SoundTrak display is active, the spectral window will divide up into two sections as shown in Figure 2. The left half of the display is used for the spectral display windows. The right half of the display is used for the SoundTrak data. Both windows can display multiple channels by stacking them up (the first channel on the top and the last channel on the bottom).

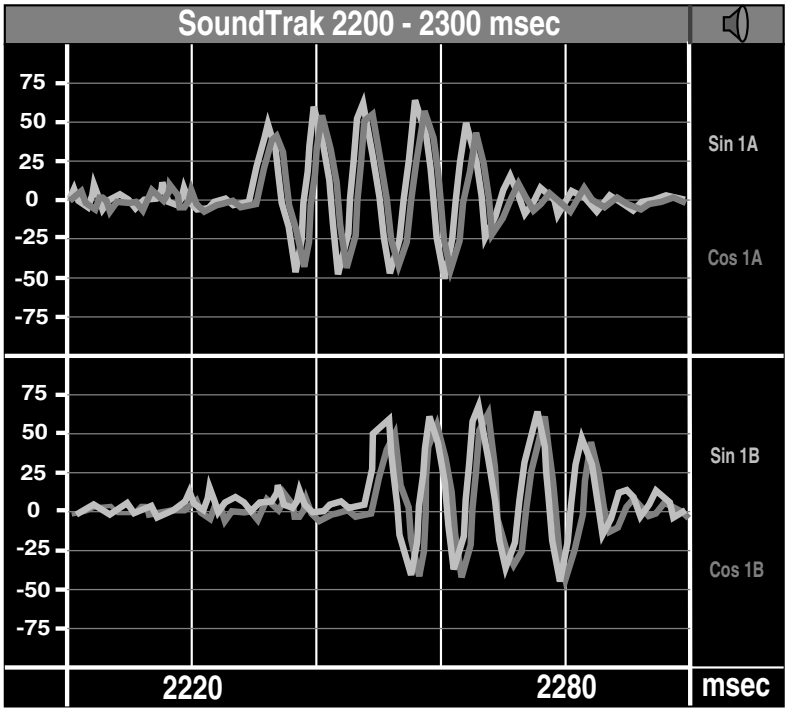


Figure 1: SoundTrak Display.

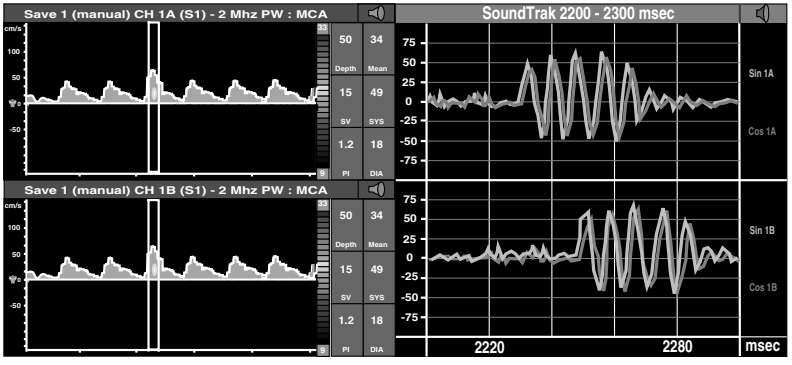


Figure 2: Spectral Snapshot with SoundTrak Display.

Note: If an M-Mode display is also present in the data file, the SoundTrak display will toggle the M-Mode display and functionality off when the SoundTrak display is present. If the SoundTrak display is turned back off, the M-Mode display and functionality returns.

The SoundTrak Display (continued)

The SoundTrak window displays the raw audio data (time-domain Doppler data) as curves. For each Doppler spectral display, there are two audio curves drawn. These represent the quadrature Doppler signals versus time and are referred to as SIN and COS channels. If no SoundTrak data is present, the system just draws a display with no data curves.

When more than one spectral channel is present, each pair of curves is drawn in its own section of the SoundTrak window and has its own scale. The labeling of the curves corresponds with the spectral channels (SIN1A, COS1A, SIN1B, COS1B) etc. The SIN channel curves are displayed in green and the COS channel curves are blue.

If there is a sudden increase in the amplitude of the reflected Doppler signal, this is easily seen in the display since the height of the curves increases. The normal Doppler signal appears near the zero line as noise leaving vertical space for high intensity events.

The time scale for the SoundTrak window is in milliseconds which provides a very high time resolution. The lowest time scale is 20 milliseconds.

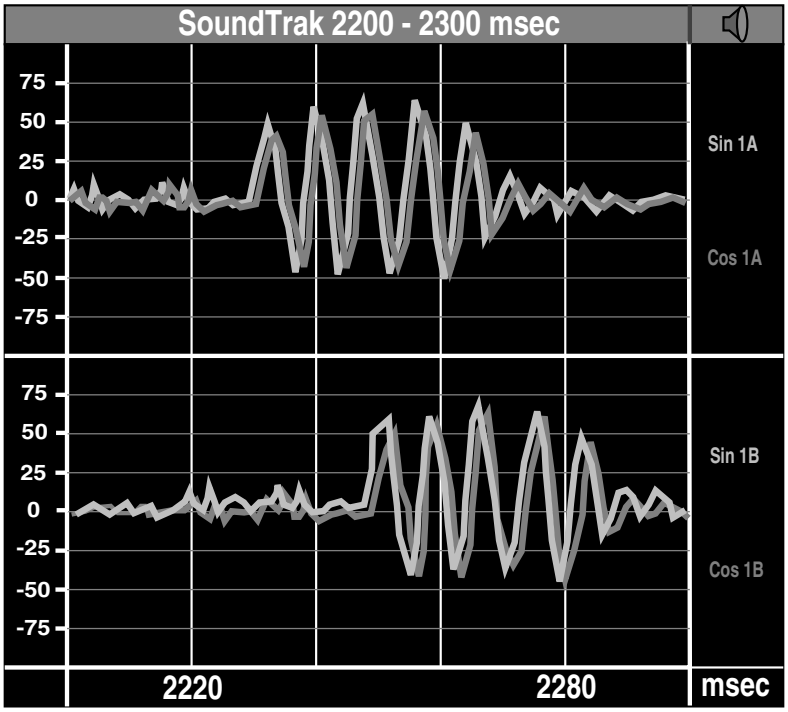


Figure 1: SoundTrak Display.

The title bar of the SoundTrak display always contains the start and end times in msec for the presently displayed data.

Note: The SoundTrak window can also be toggled on and off by clicking on the SoundTrak Display menu point in the View menu.

Adjusting the SoundTrak data amplitude scale

When the SoundTrak display is highlighted (focussed), use the **Scale** key on the remote control to adjust the displayed scale range. You may also use **Ctrl + F2** to decrease or **Shift + F2** to increase the scale setting.

Decreasing the scale setting makes the curves larger in amplitude and increasing the scale setting makes the curves smaller in amplitude.

The display scale is adjustable from –10% / +10% up to –100% / +100% in numerous steps.

The Spectral Zoom Box

When the spectral window has the SoundTrak display toggled on, a Zoom box (SoundTrak Data Position Indicator) is drawn over the spectral data which indicates the section of the spectral display which corresponds to the audio data in SoundTrak display window. The data inside the box corresponds one to one with the SoundTrak window. In other words the SoundTrak window displays the audio data used to calculate the spectral data inside the boundaries of the Zoom box.

The Zoom box is a white line box similar to the box you get when drawing a rectangle in a paint program. This box always covers the complete height of the spectral display window.

When more than one spectral channel is present, a Zoom box is drawn in each of the spectral display windows. The time position and width of the Zoom box is the same in each spectral display window. It is not possible to move the position of an individual Zoom box without altering the other Zoom boxes.

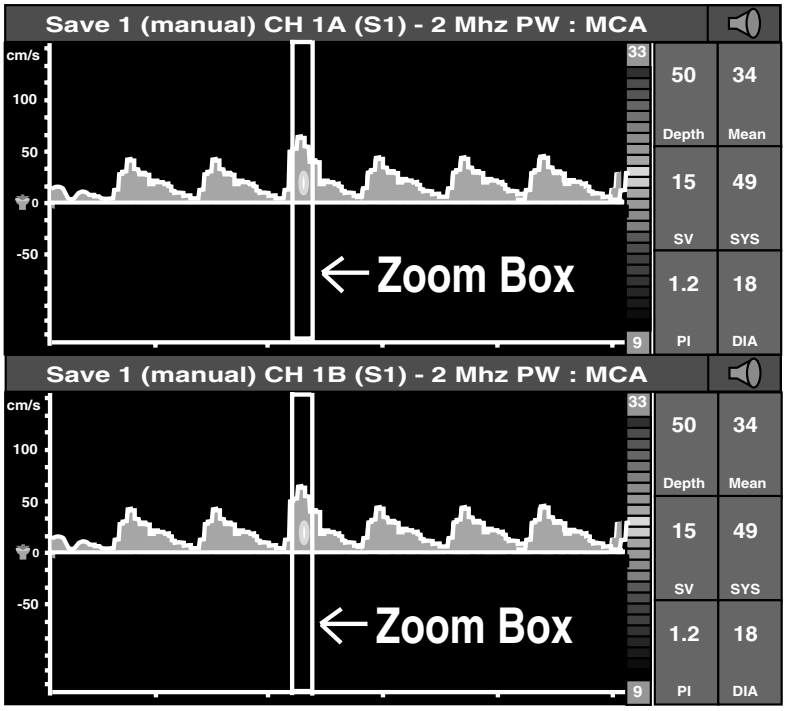


Figure 1: Spectral Display Window with SoundTrak Zoom Box.

Note: When more than one spectral display is present, the Zoom boxes are all "tied" together so they always have the same size and position in each spectral display. Each time the Zoom box is altered in one spectral display, the other Zoom boxes readjust to the new position automatically. This is needed to ensure that the time delay measurements are accurate in the SoundTrak display.

Adjusting the Size and Position of the Spectral Zoom Box

This section describes how to alter the size and placement of the Zoom box using hot keys.

Using Hot Keys

The horizontal placement of the Zoom box (Figure 1) is adjustable by using the left / right arrow keys on the remote control or keyboard when the SoundTrak display is focused.

The width of the Zoom box (Figure 2) is adjustable by using the **Sweep** key on the remote control when the SoundTrak display is focused. You may also use **Ctrl + F8** to decrease or **Shift + F8** to increase the width.

Each time the Zoom box is altered, the SoundTrak display is updated with the new data corresponding to the new position.

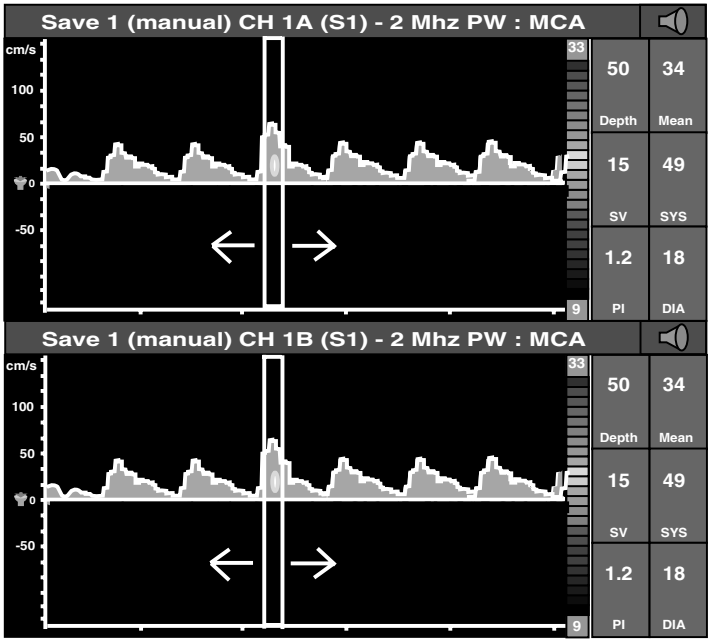


Figure 1: Adjusting Spectral Zoom Box Position.

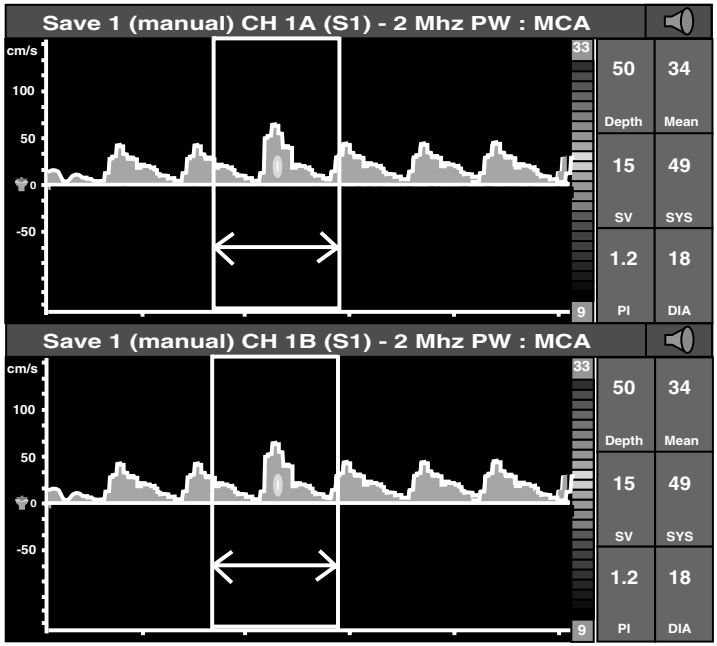


Figure 2: Adjusting Spectral Zoom Box Width.

Adjusting the Size and Position of the Spectral Zoom Box

This section describes how to alter the size and placement of the Zoom box using the mouse.

Using the Mouse

The width and horizontal position of the Zoom box may also be set by clicking the left mouse button in any spectral display window, dragging, and then releasing the button (Figure 1). This is similar to the selection facility in any standard paint program.

A similar function (Figure 2) is also provided in the SoundTrak display window as well to allow zooming in on the data.

When the mouse is used to draw the Zoom box in a spectral display, the window focus automatically goes back to the SoundTrak display after the Zoom box position is chosen. This allows fine adjustments later with the arrow keys without any focus problems.

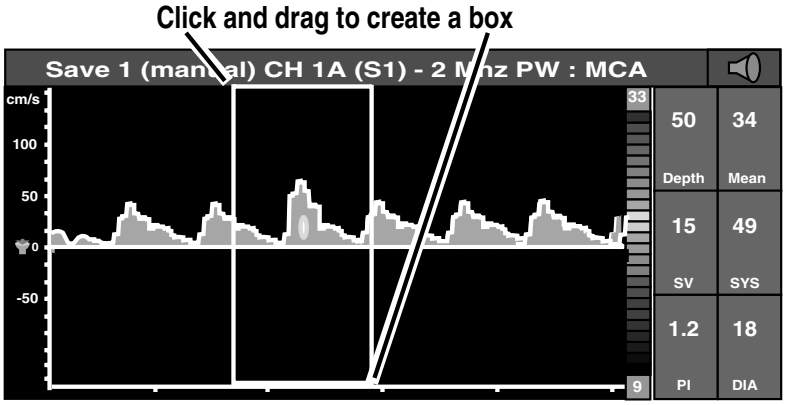


Figure 1: Drawing Spectral Zoom Box with Mouse.

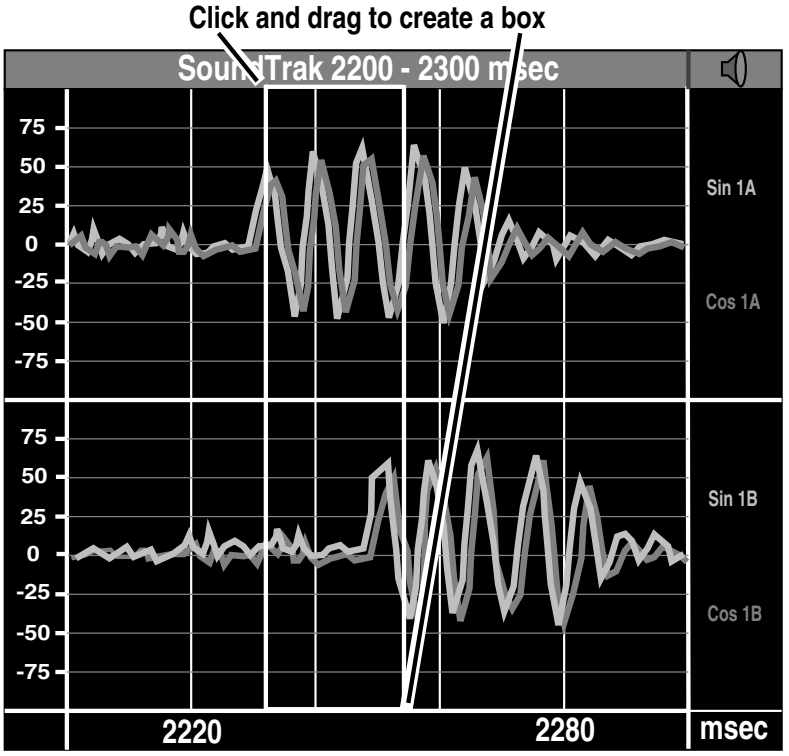


Figure 2: Drawing SoundTrak Zoom Box with Mouse.

Default Zoom Box Positions

This section describes how the default Zoom box position and size is determined under the various circumstances.

Reading in H.I.T.S. Records

When spectral snapshots, containing H.I.T.S. events, are read in, the default size and position of the Zoom box is done automatically. In the case that a H.I.T.S. event is present (Auto-save), the Zoom box is placed around the first event in the record with the event centered in time. The Zoom box is 1 second wide by default so it would start ½ a second before and end ½ a second after the event time as found by the FS1 algorithm.

Reading in H.I.T.S. Events

If a saved H.I.T.S. event is selected out of the event list, the system automatically relocates the Zoom box positioned around the new event. This is a quick way to switch between events and review them. If the event is located inside the same spectral save, just the position of the Zoom box changes, otherwise the new record is loaded first.

Reading in Manually Saved Records

For manually saved records, the Zoom box is also 1 second wide and time centered in the spectral display.

If limits are encountered, then the edge of the display is used for the start or stop time position.

Saving the Default Zoom Box Position for a Saved Record

After adjusting the position of the Zoom box on a record, the new size and position of the Zoom box can be saved to the record by using the **Save** function.

When the record is read in again the next time, the new default positions will be used.

Note: The default Zoom box position can only be saved for spectral records. The default Zoom box positions for H.I.T.S. events are determined by the algorithm.

Measuring Time Differences in the SoundTrak Data

This section describes how to measure time delays in the SoundTrak data by setting a cursor in the SoundTrak display. This functionality is typically used with multidepth H.I.T.S. recordings to measure the time delay of an event between channels.

Activating the General Cursor Mode

The General Cursor Mode for the SoundTrak display (Figure 1) can be switched on and off by:

1. Right clicking in the SoundTrak display (Figure 2).

2. Clicking on the function **General Cursors** (Figure 3).

When the General Cursor Mode is active, the mouse pointer will change into a differential time cursor pointer when the mouse is positioned in the data section of the SoundTrak display (Figure 1).

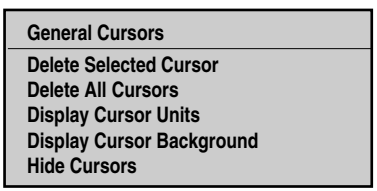


Figure 3: SoundTrak Right Click Menu.

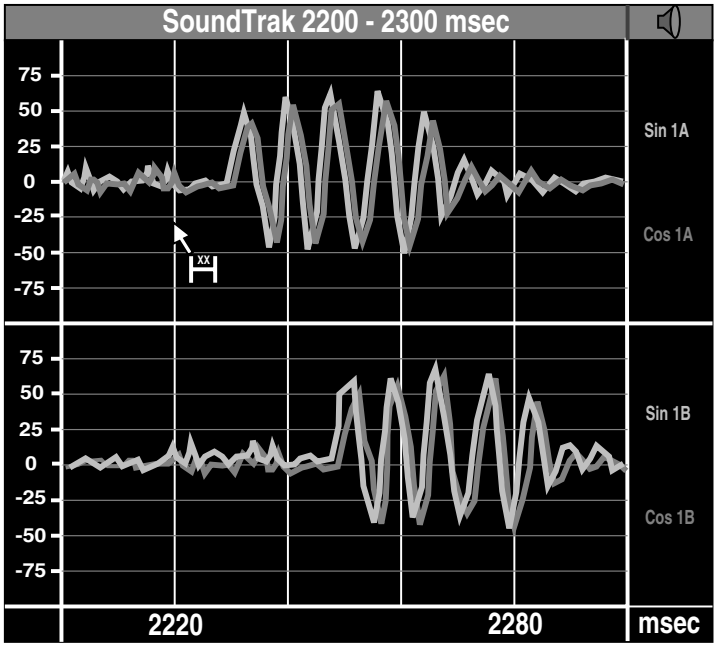


Figure 1: SoundTrak Display General Cursor Mode.

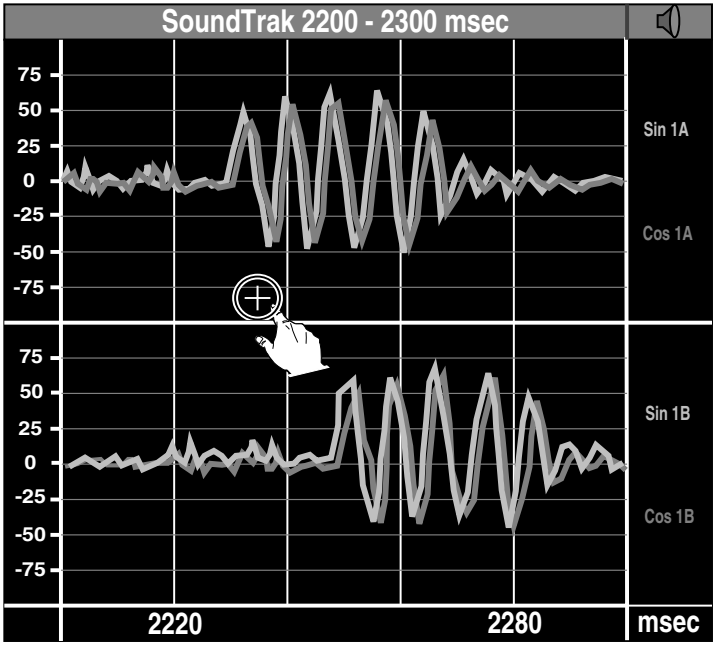


Figure 2: Right Click Inside of SoundTrak Display.

Measuring Time Differences in the SoundTrak Data (continued)

Differential Time cursors are single value cursors which measure the time difference between any two points in the SoundTrak display. This method is very useful when making time delay measurements.

Setting Differential Time Cursors

The SoundTrak Differential Time cursors may be set by:

1. Clicking on the first of **two points** you want to measure and then holding down the Left mouse button (Figure 1).

2. Dragging the mouse until the highlighted box is over the second point and then releasing the mouse button (Figure 1).

An H-**Bar**' appears between the two points and the differential time value is displayed (Figure 2).

Saving Differential Time Cursors

The SoundTrak Differential Time Cursors may be saved by simply resaving the spectral record.

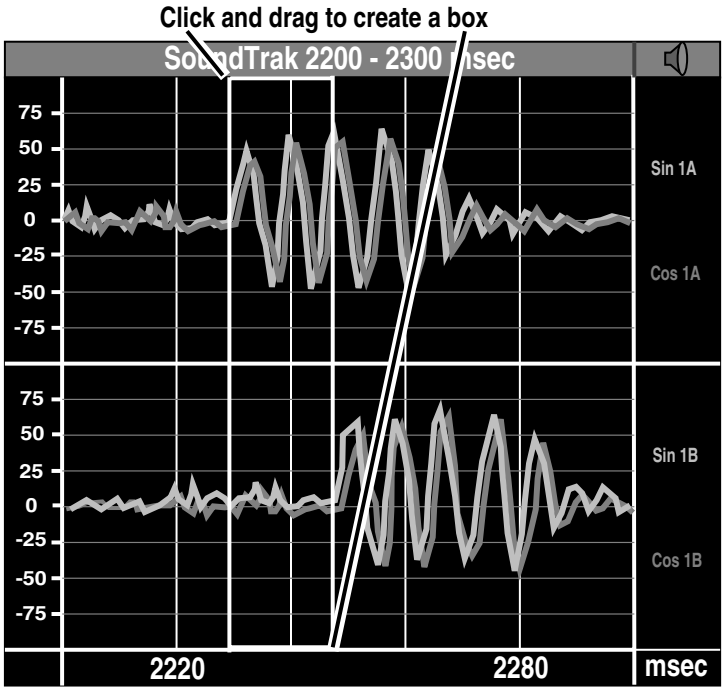


Figure 1: SoundTrak Display - Setting a Differential Time Cursor.

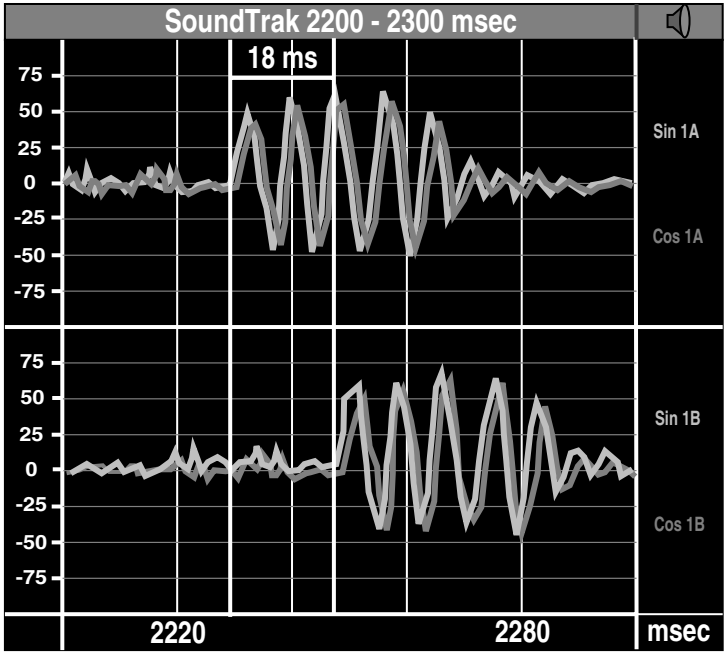


Figure 2: SoundTrak Display - Differential Time Cursor.

Working With SoundTrak Differential Time Cursors

Moving Differential Time Cursors

The SoundTrak Differential Time cursors may be moved by clicking the left mouse button on a cursor, holding down the button and dragging the cursor to a new position, and then releasing the button.

Resizing Differential Time Cursors

The SoundTrak Differential Time cursors may be resized by first single clicking the left mouse button on a cursor to activate it and then clicking the mouse on one of the small resize handles (half way up the vertical boundary lines), holding down the button, dragging the boundary line to a new position, and then releasing the button.

Deleting Individual Cursors

The SoundTrak Differential Time cursors may be deleted by first single clicking the left mouse button on a cursor to activate it and then pressing the delete key or right clicking the mouse on the cursor and then selecting **Delete Selected Cursor** from the menu (Figure 1).

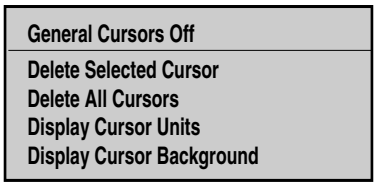


Figure 1: SoundTrak General Cursor Mode Right Click Menu.

Deleting All Cursors

All the displayed SoundTrak Differential Time Cursors may be deleted all at once from the display by right clicking the mouse anywhere in the display data and then selecting **Delete All Cursors** from the menu (Figure 1).

Displaying Cursor Units

The units (msec) for the SoundTrak cursors may be toggled on for a record by right clicking the mouse anywhere in the SoundTrak display data and then selecting **Display Cursor Units** from the menu. The units may be toggled off by right clicking the mouse anywhere in the SoundTrak display and then selecting **Remove Cursor Units** from the menu.

Clearing Cursor Background

At times the cursor values may be difficult to read if the numbers are written directly over the curve data. For this reason it is possible to clear the background data for the cursor value by right clicking the mouse anywhere in the SoundTrak display data and then selecting **Clear Cursor Background** from the menu (Figure 1). The background may be toggled back on by right clicking the mouse anywhere in the display data and then selecting **Display Cursor Background** from the menu (Figure 1).

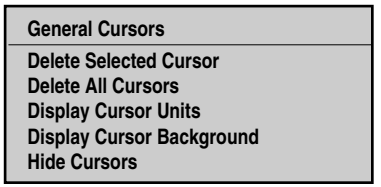


Figure 2: SoundTrak Right Click Menu.

Deactivating the General Cursor Mode

The General Cursor Mode for the SoundTrak display can be switched off by:

1. Right clicking in the SoundTrak display window.

2. Clicking on the function **General Cursors Off** (Figure 1).

Hiding Cursors

The SoundTrak Differential Time cursors may be temporarily removed from the display by right clicking the mouse anywhere in the SoundTrak display data and then selecting **Hide Cursors** from the menu (Figure 2). The cursors may be toggled back on by right clicking the mouse anywhere in the curve display data and then selecting **Show Cursors** from the menu.

Note: The **Hide Cursors** and **Show Cursors** functions are only available when the General Cursor Mode is switched off.

Mon. Only Reviewing Trend data

This section describes how to review the Trend data that was collected during the Monitoring acquisition mode.

Note: The procedures in this section of the chapter are for the Monitoring Mode only, not the Diagnostic Mode.

Saving the Trend configuration

You can save the present Trend and Fast Curve display settings with the present file so the next time you review the data, the settings will be selected automatically by the system.

The Trend settings that will be saved include:

- Curves
- Curve colors
- Value scales
- Time scales
- Window sizes
- Event marker display configuration
- Cursors

1. Click on **Configuration** (Figure 2).

2. Click on **Save Configuration**.

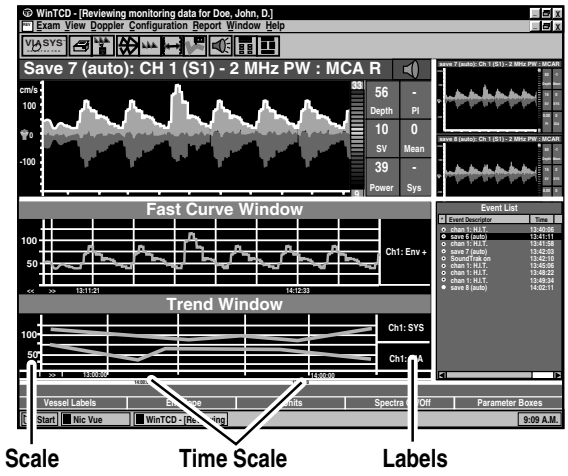


Figure 1: The Trend window can display up to 11 trend curves per channel. This example shows two trend curves (Sys and Dia) have been selected.

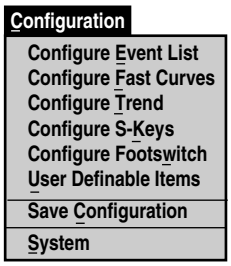


Figure 2: Click on Configuration and then on Save Configuration.

Configure the Trend curves display

You can choose to have the Trend window display the long-term monitoring curves of designated Doppler parameters (Figure 1).

The Trend window (Figure 1) can display up to 11 trend curves per channel specified via the Configure Trend window (Figure 2).

Method 1

1. Position the mouse pointer (it will change to a crosshair) anywhere inside the Trend window (Figure 1) and then click the **Right** mouse button.

2 Click on **Curve Configuration** (Figure 2).

3. Go to the next page.

Method 2

1. Click on **Configuration** (Figure 3).

2. Click on **Configure Trend**.

3. Click on **Curve Configuration** (Figure 4).

4. Go to the next page.

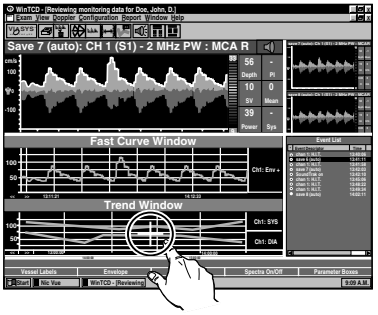


Figure 1: Right click inside the Trend window.

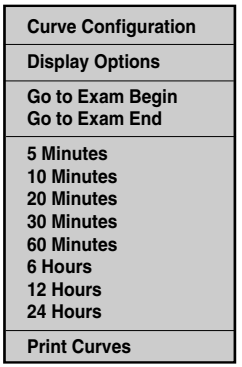


Figure 2: Click on Curve Configuration.

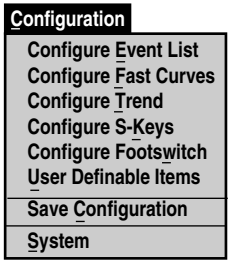


Figure 3: Click on Configure Trend.

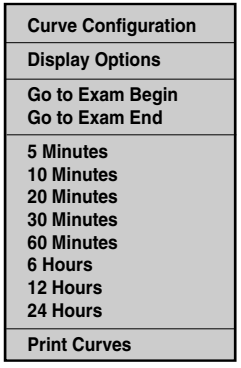


Figure 4: Click on Curve Configuration.

Choose the Trend curves for display and curve colors

Any combination of six curve choices for display (flowing toward or away from the transducer) can be assigned one of eight possible colors.

- **Systole**
- **Diastole**
- **Mean**
- **PI** (Pulsatility Index)
- **RI** (Resistance Index)
- **H.I.T.S.**

1. Choose the trend curve you want displayed by clicking on (checkmark) its associated **check box** and then choose with which **color** you want the curve displayed (Figure 1). Click on the next **Channel # tab** and repeat as necessary.

Set the Trend curves scales

2. Click on the **TCD Scale Limits** tab and set the **Minimum** and **Maximum** Y-scale ranges (Figure 2).

Choose the external inputs to be displayed

3. Click on the **External Inputs** Configuration tab (if available) and then checkmark the curves to be displayed, their colors, and their scale limits (Figure 3).

4. When finished making your selections, click on **OK.**

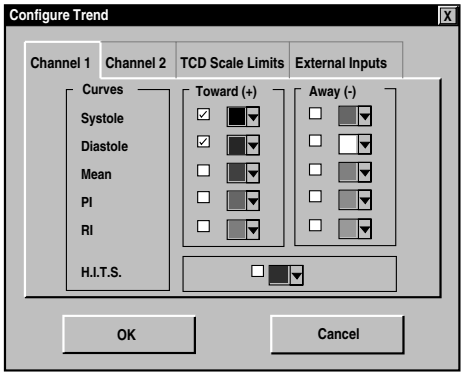


Figure 1: Click on (checkmark) each of the trend curves checkboxes you want displayed and then click on the Show Menu arrow button and choose with which color you want each curve displayed.

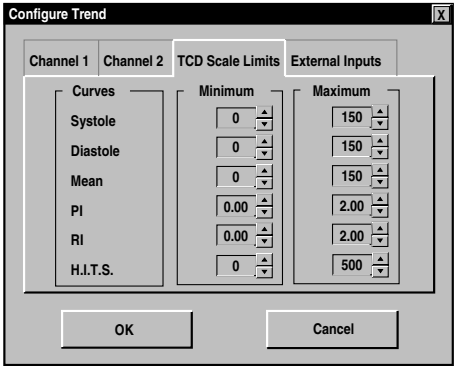


Figure 2: Click on the Up/Down Arrow buttons to choose the desired Minimum and Maximum scale ranges with which you want each curve displayed.

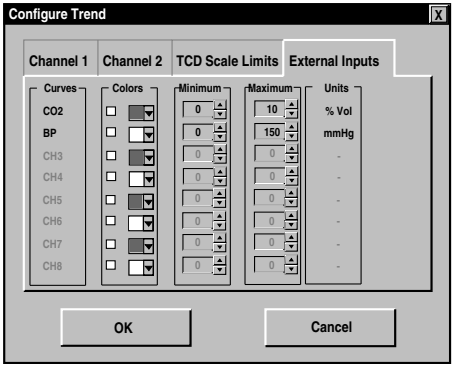


Figure 3: Click on (checkmark) each of the external inputs you want displayed and then click on OK.

Set the Trend display options

1. Click on the **Display Options** menu point in the Trend configuration menu (Figure 1) and the Display Trend Options dialog will appear (Figure 2).

Choose which events will be displayed

2. Click on the events you want displayed in the Trend window (Figure 2).
   - Mode Change
   - Doppler Settings
   - Save Events
   - H.I.T.S.
   - User Defined Events

Event types which are not checked will just be displayed as a tick at the top of the display with no text.

Toggle scale sharing

3. Check the **Scale Sharing** function to toggle the scale sharing on. This will allow more than one trend curve to be displayed in the same scale section of the trend. Leave the box unchecked to force each trend curve to have its own scale section in the trend.

Toggle background grid

4. Check the **Show Background Grid** function to toggle the background grid for the trend on and off. Leave the box unchecked to hide the grid.

5. When finished making your selections, click on **OK.**

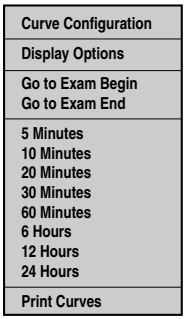


Figure 1: Click on Display Options.

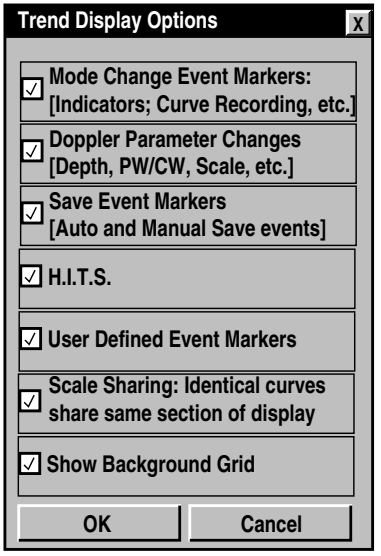

Trend Display Options
X
Mode Change Event Markers: [Indicators; Curve Recording, etc.]
Doppler Parameter Changes [Depth, PW/CW, Scale, etc.]
Save Event Markers [Auto and Manual Save events]
H.I.T.S.
User Defined Event Markers
Scale Sharing: Identical curves share same section of display
Show Background Grid
OK
Cancel

Figure 2: Make your choices by clicking on (checkmarking) the desired option(s).

Choosing the Trend Curves time scale display

You can choose from eight time scales with which the Trend data will be displayed. This lets you, in effect, 'compress' the data thus allowing you to view a longer record of the Trend data (Figure 1). The time scale options offered on the menu depends on the record length of the Trend data. If e.g. there is less than 20 minutes of data, then the 20 minutes or greater options will not appear on the menu.

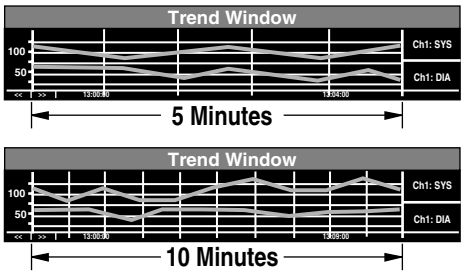


Figure 1: The effects of increasing the time scale from 5 minutes to 10 minutes. The lower example now displays a record length of Curve data two times longer than the upper example.

Method 1

1. Right click inside the **Trend window** (Figure 2).
2. Click on the desired time scale (Figure 3).

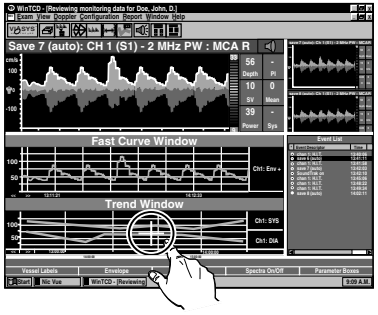


Figure 2: Right click inside the Trend window.

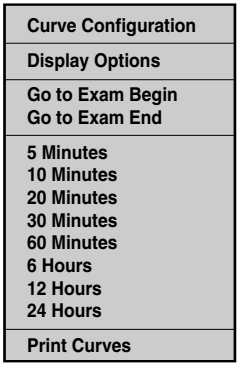


Figure 3: Click on the desired time scale.

Method 2

1. Click on **Configuration** and then on **Configure Trend** (Figure 4).
2. Click on the desired time scale (Figure 5).

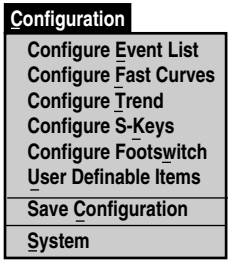


Figure 4: Click on Configuration and then on Configure Trend.

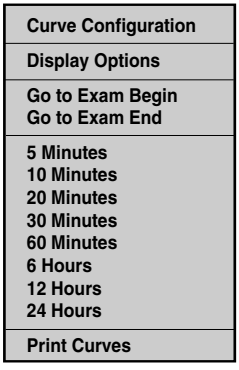


Figure 5: Click on the desired time scale.

Jumping to the end/start of the Trend data

You can jump to the end or the beginning of the Trend data without having to scroll through the data using either of the following methods.

Note: Recalling events out of the Event List will recall the Trend and Fast Curve data from that position.

Method 1

1. Right click inside the **Trend window** (Figure 1).

2. Click on **Go to Exam End** or **Go to Exam Begin** (Figure 2).

Method 2

2. Click on **Configuration** and then on **Configure Trend** (Figure 3).

3. Click on **Go to Exam End** or **Go to Exam Begin** (Figure 4).

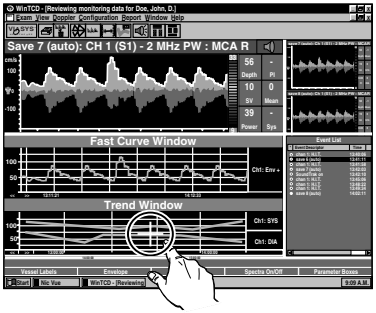


Figure 1: Right click inside the Trend window.

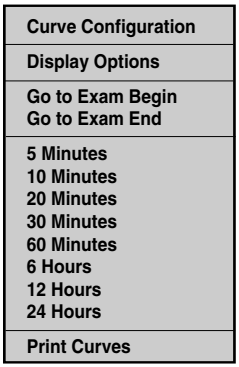


Figure 2: Click on Go to Exam Begin or Go to Exam End.

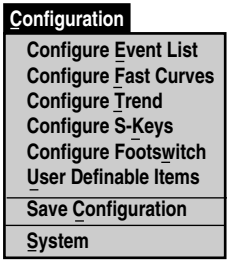


Figure 3: Click on Configuration and then on Configure Trend.

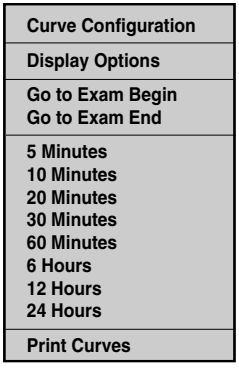


Figure 4: Click on Go to Exam Begin or Go to Exam End.

Scrolling through the Trend data

When the Trend data record is longer than the width of the Trend window, some of the data can not be viewed. If this happens, use either of the methods below to scroll the off screen data back into view.

Note: When scrolling through the Trend data, think of the window as sliding left or right while the data remains stationary (Figure 1).

Note: You can also scroll through the Trend data while recording Doppler during an exam.

Method 1

1. Click on the **Left Scroll** button (Figure 2) to move the Trend window to the left or click on the **Right Scroll** button to move the Trend window to the right.

Method 2

1. Focus the Trend window.
2. Press the **Left** or **Right Arrow** button on the remote control to scroll through the Trend data (Figure 3).

Method 3

1. Press the **Left** or **Right Arrow** button on the keyboard to scroll through the Trend data.

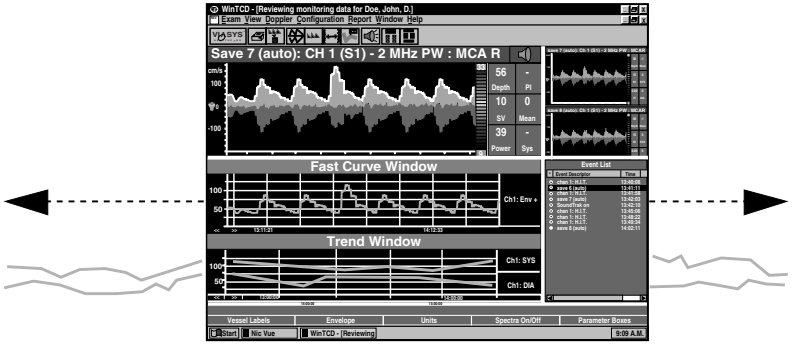


Figure 1: Use the Scroll buttons to bring off screen Trend data back into view.

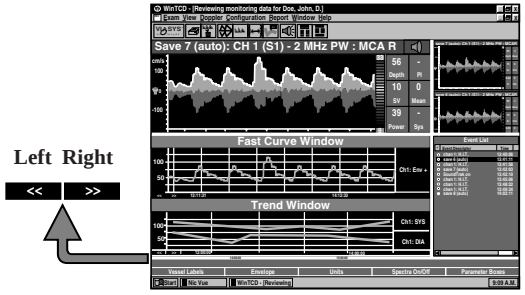


Figure 2: Click on the Left Scroll or Right Scroll buttons to scroll through the Trend data.

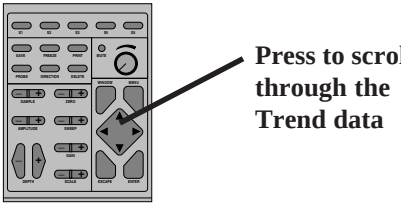


Figure 3: Press the Left or Right Arrows to scroll through the Trend data.

Zooming in on the Trend data

You can zoom in on the Trend Curves for closer inspections.

1. Left click inside the **Trend window** and hold down the mouse button (Figure 1).
2. Drag the mouse to create a box inside the window and then release the mouse button.
3. The Trend Curve display expands horizontally.
4. Repeat steps 1 and 2 as desired. If the message '*Selected zoom not supported for Trend data*' appears on the Status Bar directly above the Softkeys, make the box you are drawing longer.

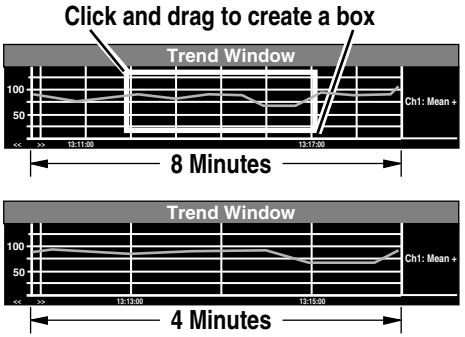


Figure 1: Clicking inside the Trend Window and then dragging the mouse to create a box results in zooming in (expanding) the Trend data as illustrated in the lower figure.

Unzooming the Trend display

To return the Trend data display to its original length.

Method 1

1. Right click inside the **Trend window** (Figure 2).
2. Click on the desired time scale**:** (Figure 3).

Method 2

1. Click on **Configuration** and then on **Configure Trend** (Figure 4).
2. Click on the desired time scale**:** (Figure 5).

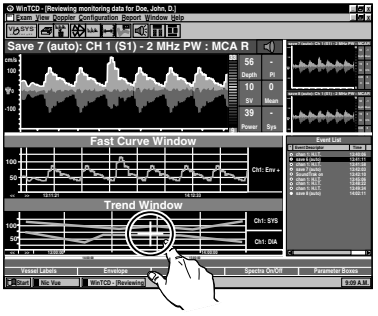


Figure 2: Right click inside the Trend window.

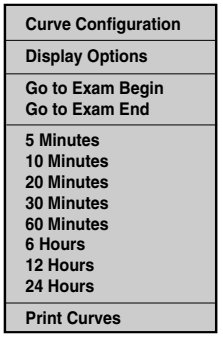


Figure 3: Click on the desired time scale.

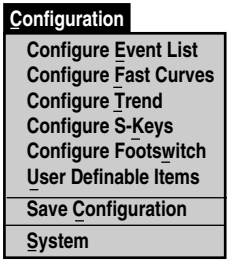


Figure 4: Click on Configuration and then on Configure Trend.

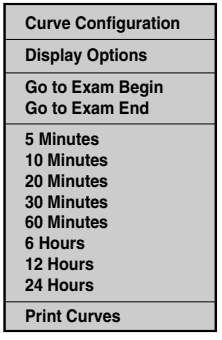


Figure 5: Click on the desired time scale.

Mon. Only Reviewing Fast Curve data

The Fast Curve window displays the Envelope Toward and Envelope Away data collected for each of the channels during Monitoring acquisitions.

Note: The procedures in this section of the chapter are for the Monitoring Mode only, not the Diagnostic Mode.

The Fast Curve window has fixed, selectable time scales of 2, 5, 10, 20, and 30 seconds.

Saving the Fast Curve configuration

You can save the present Trend and Fast Curve display settings with the present file so the next time you review the data, the settings will be selected automatically by the system.

The Fast Curve settings that will be saved include:

- Curves
- Curve colors
- Value scales
- Time scales
- Window sizes
- Display events
- Cursors

1. Click on **Configuration** (Figure 2).

2. Click on **Save Configuration**.

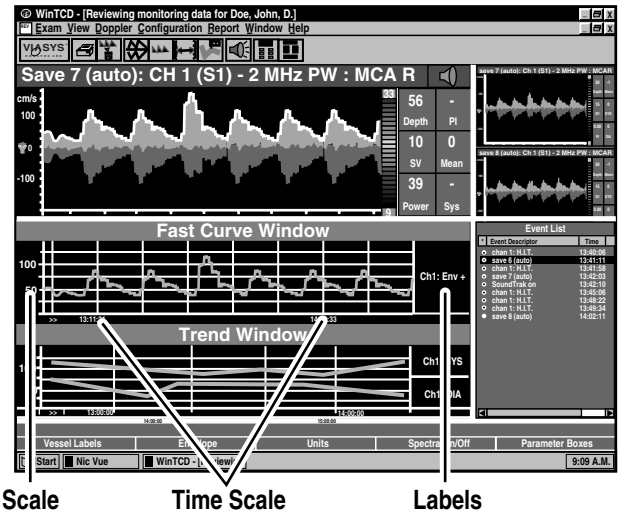

WinTCD - [Reviewing monitoring data for Doe, John, D.]
Exam View Doppler Configuration Report Window Help
Save 7 (auto): CH 1 (S1) - 2 MHz PW : MCA R
Fast Curve Window
Trend Window
Event List
Vessel Labels
Parameter Boxes
Scale
Time Scale
Labels

Figure 1: The Fast Curve window displays the Envelope Towards and Away curves. This example shows only the Envelope Towards curve has been selected for display.

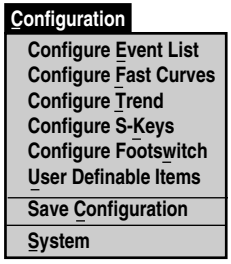


Figure 2: Click on Configuration and then on Save Configuration.

Configure the Fast Curve display

You can choose to view the Envelope Toward and/or Envelope Away curves, set the Fast Curves Y-axis scales, and which events you want displayed in the Fast Curve window.

Method 1

1. Position the mouse pointer (it will change to a crosshair) anywhere inside the Fast Curve window (Figure 1) and then click the **Right** mouse button.

2 Click on **Curve Configuration** (Figure 2).

3. Go to the next page.

Method 2

1. Click on **Configuration** (Figure 3).

2. Click on **Configure Fast Curves**.

3. Click on **Curve Configuration** Figure 4.

4. Go to the next page.

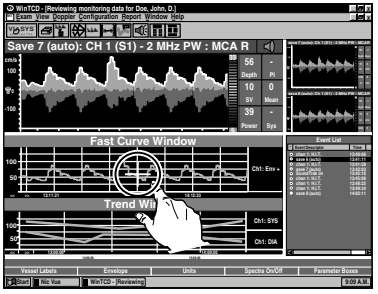


Figure 1: Right click inside the Fast Curves window.

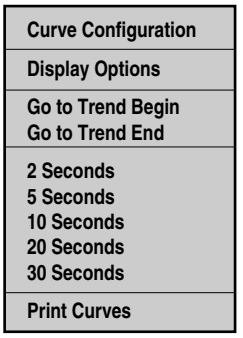


Figure 2: Click on Curve Configuration.

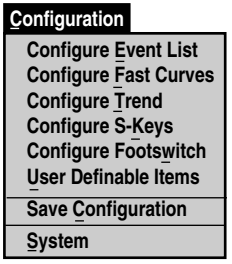


Figure 3: Click on Configuration and then on Configure Fast Curves.

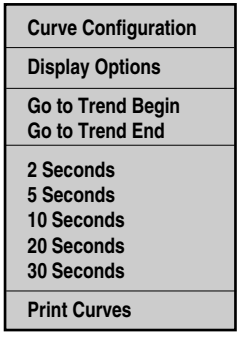


Figure 4: Click on Curve Configuration.

Choose the Fast Curves for display and curve colors

1. Choose the Fast Curve you want displayed by clicking on (checkmarking) its associated **checkbox** and then choose with which **color** you want the curve displayed (Figure 1). Click on the next **Channel # tab** and repeat as necessary.

Set the Fast Curve scales

2. Click on the **TCD Scale Limits** tab and set the **Minimum** and **Maximum** Y-scale ranges (Figure 2).

Choose the external inputs to be displayed

3. Click on the **External Inputs** Configuration tab (if available) and then checkmark the curves to be displayed, their colors, and their scale limits (Figure 3).

4. When finished making your selections, click on **OK.**

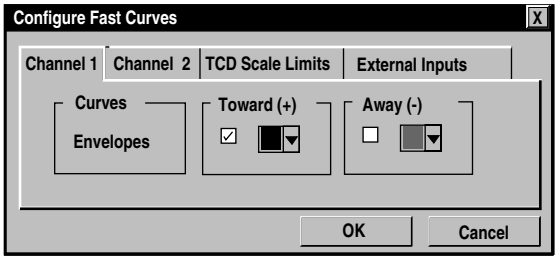


Figure 1: Click on (checkmark) each of the fast curves checkboxes you want displayed and then click on the Show Menu arrow button and choose with which color you want each curve displayed.

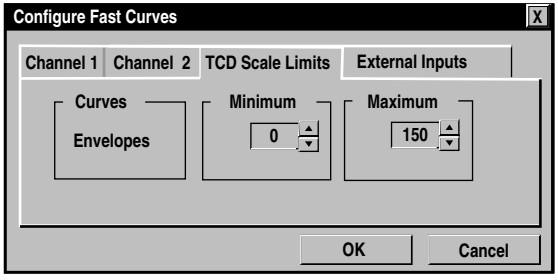


Figure 2: Click on the Up/Down Arrow buttons to choose the desired Minimum and Maximum scale ranges with which you want each curve displayed.

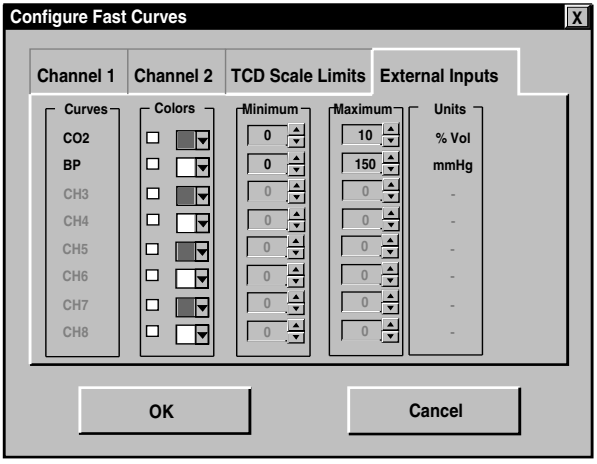


Figure 3: Click on (checkmark) each of the external inputs you want displayed and then click on OK.

Set the Fast Curves display options

1. Click on the **Display Options** menu point in the Fast Curve configuration menu (Figure 1) and the Fast Curve Display Options dialog will appear (Figure 2).

Choose which events will be displayed

2. Click on the events you want displayed in the Fast Curve window (Figure 2).
   - Mode Change
   - Doppler Settings
   - Save Events
   - H.I.T.S.
   - User Defined Events

Event types which are not checked will just be displayed as a tick at the top of the display with no text.

Toggle scale sharing

3. Check the **Scale Sharing** function to toggle the scale sharing on. This will allow more than one curve to be displayed in the same scale section of the display. Leave the box unchecked to force each curve to have its own scale section in the display.

Toggle background grid

4. Check the **Show Background Grid** function to toggle the background grid for the fast curve display on and off. Leave the box unchecked to hide the grid.

5. When finished making your selections, click on **OK.**

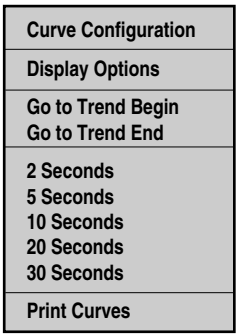


Figure 1: Click on Display Options.

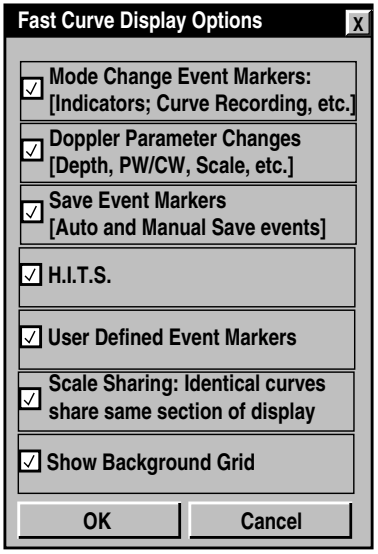

Fast Curve Display Options
X
Mode Change Event Markers: [Indicators; Curve Recording, etc.]
Doppler Parameter Changes [Depth, PW/CW, Scale, etc.]
Save Event Markers [Auto and Manual Save events]
H.I.T.S.
User Defined Event Markers
Scale Sharing: Identical curves share same section of display
Show Background Grid
OK
Cancel

Figure 2: Make your choices by clicking on (checkmarking) the desired option(s).

Choosing the Fast Curves time scale display

You can choose from five time scales with which the Fast Curves data will be displayed. This lets you, in effect, 'compress' the Fast Curve data thus allowing you to view a longer record of the Fast Curve data. Choices offered depends on the record length of the data.

Method 1

1. Right click inside the **Fast Curves window** (Figure 1).
2. Click on the desired time scale**:** **2**, **5**, **10**, **20**, or **30 seconds** (Figure 2).

Method 2

1. Click on **Configuration** and then on **Configure Fast Curves** (Figure 3).
2. Click on the desired time scale**:** **2**, **5**, **10**, **20**, or **30 seconds** (Figure 4).

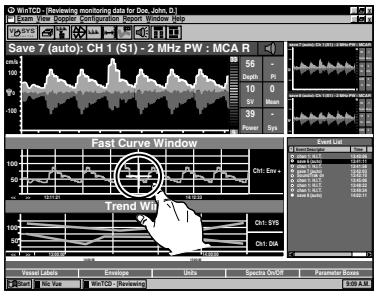


Figure 1: Right click inside the Fast Curves window.

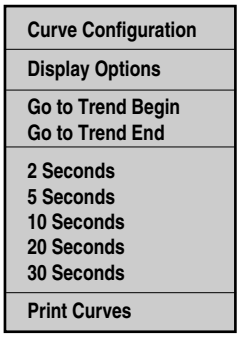


Figure 2: Click on the desired time scale.

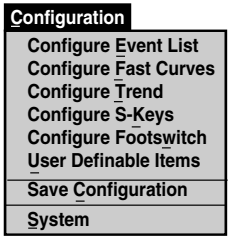


Figure 3: Click on Configuration and then on Configure Fast Curves.

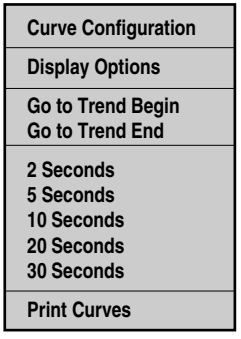


Figure 4: Click on the desired time scale.

Moving the Fast Curve data to the end/beginning of the Trend data

The Fast Curve Position Indicator is a vertical, white bar located in the Trend window which marks the center of the Fast Curve window. You can jump the Indicator to the end or beginning of the Trend data. The Fast Curve data window will automatically update to correspond to the Indicator's new location if the Indicator moves outside of the current range of the displayed Fast Curve data.

Method 1

1. Right click inside the **Fast Curves window** (Figure 1).

2. Click on **Go to Trend End** or **Go to Trend Begin** (Figure 2).

Method 2

2. Click on **Configuration** and then on **Configure Fast Curves** (Figure 3).

3. Click on **Go to Trend End** or **Go to Trend Begin** (Figure 4).

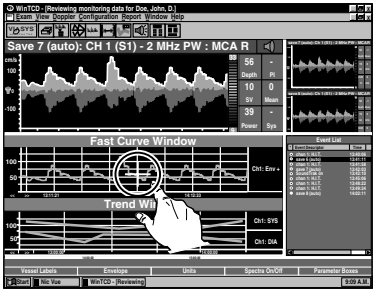


Figure 1: Right click inside the Fast Curves window.

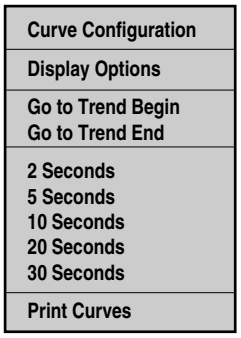


Figure 2: Click on Go to Trend Begin or Go to Trend End.

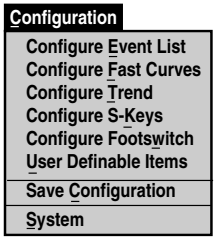


Figure 3: Click on Configuration and then on Configure Fast Curves.

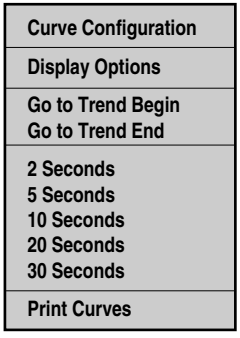


Figure 4: Click on Go to Trend Begin or Go to Trend End.

Scrolling through the Fast Curves data

When the Fast Curves data record is longer than the width of the Fast Curves window, some of the Curves data can not be viewed. When this happens, use either of the methods below to scroll the off screen data back into view.

The Fast Curve and Trend windows are synchronized. The Fast Curve Position Indicator in the Trend window indicates the center time position of the data displayed in the Fast Curve window.

Note: When scrolling through the Fast Curves data, think of the window as sliding left or right while the data remains stationary (Figure 1).

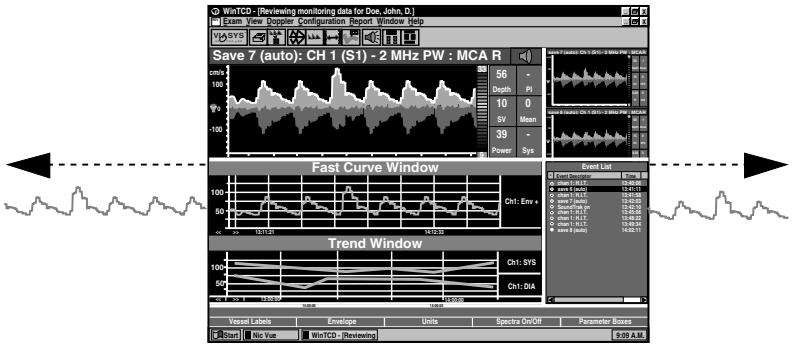

WinTCD - [Reviewing monitoring data for Doe, John, D.]
Save 7 (auto): CH 1 (S1) - 2 MHz PW : MCA R
Fast Curve Window
Trend Window
Ch1: Env
Ch1: SYS
Ch1: DIA
Event List

Figure 1: Use the Scroll buttons to bring off screen Fast Curves data back into view.

Method 1

1. Click on the **Left Scroll** button (Figure 2) to move the Fast Curves window to the left or click on the **Right Scroll** button to move the Fast Curves window to the right.

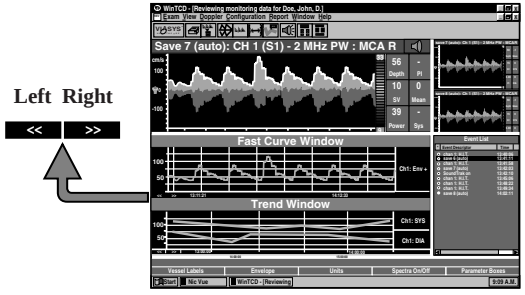


Figure 2: Click on the Left Scroll or Right Scroll buttons to scroll through the Fast Curves data.

Method 2

1. Focus the Fast Curves window.

2. Press the **Left** or **Right Arrow** button on the remote control to scroll through the Fast Curves data (Figure 3).

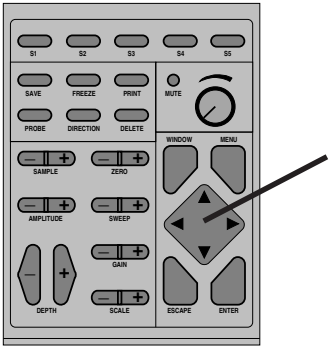


Figure 3: Press the Left or Right Arrows to scroll through the Fast Curves data.

Zooming in on the Fast Curves display

You can zoom in on the Fast Curves for closer inspections.

1. Left click inside the **Fast Curves window** and hold down the mouse button (Figure 1).
2. Drag the mouse to create a box inside the window and then release the mouse button.
3. The Fast Curves display expands horizontally.
4. Repeat steps 1 and 2 as desired. If the message '*Selected zoom not supported for Fast Curve data*' appears on the Status Bar directly above the Softkeys, make the box you are drawing longer.

Unzooming the Fast Curves display

To return the Fast Curves data display to its original length.

Method 1

1. Right click inside the **Fast Curves window** (Figure 2).
2. Click on the desired time scale**:** **2**, **5**, **10**, **20**, or **30 seconds** (Figure 3).

Method 2

1. Click on **Configuration** and then on **Configure Fast Curves** (Figure 4).
2. Click on the desired time scale**:** **2**, **5**, **10**, **20**, or **30 seconds** (Figure 5).

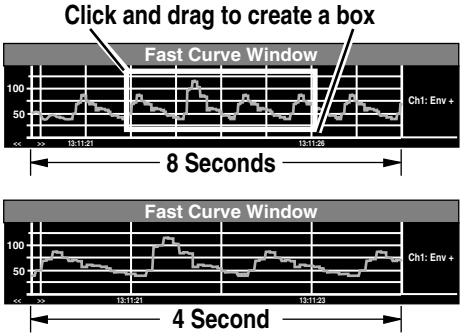


Figure 1: Clicking inside the Fast Curve Window and then dragging the mouse to create a box results in zooming in (expanding) the Fast Curve data as illustrated in the lower figure.

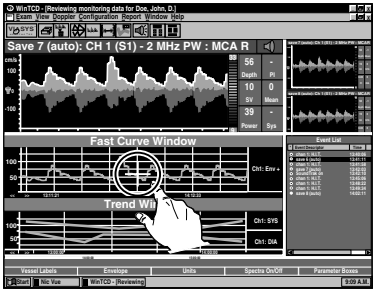


Figure 2: Right click inside the Fast Curves window.

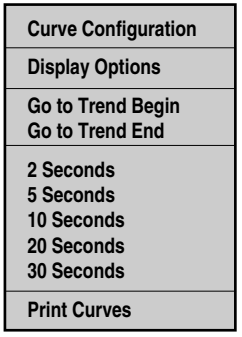


Figure 3: Click on the desired time scale.

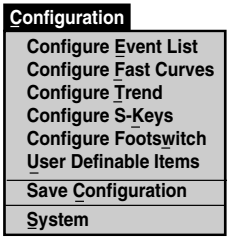


Figure 4: Click on Configuration and then on Configure Fast Curves.

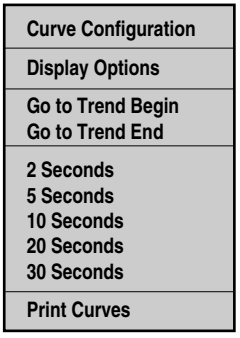


Figure 5: Click on the desired time scale.

Mon. Only Saving Event Markers - *Monitoring Mode only*

There are two types of user defined event markers which are supported in the WinTCD software package. The first type of marker is intended for interval events (I-Markers). These events are start / stop type markers which describe events that happen over an interval of time. The second type of marker is intended for single events (S-Markers). These events are one shot markers which describe events that only happen at one moment in time.

Markers are usually saved during the acquire mode but can also be saved in the review mode by using the method described on this page.

The set markers will be drawn in the curve displays at the chosen time position using the color light green and these will also be added to the event list.

Method 1

1. Position the mouse pointer (it will change to a crosshair) inside the Trend or Fast Curve window at the point in time where the marker should be set (Figure 1) and then click the **Right** mouse button.

2. Select either **Insert S-Marker** or **Insert I-Marker** out of the menu (Figure 2).

3. Select the appropriate marker out of the list (Figure 3) using the mouse or use the up/down arrow keys to select the label and press enter to save it.

Note: Refer to section S5 in this manual for information on configuring the S-Marker and I-Marker lists.

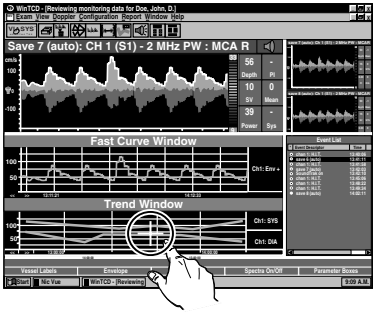


Figure 1: Right click inside the Trend window.

Figure 2: Right click Trend window menu (lower section).

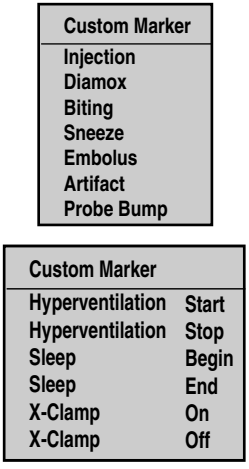


Figure 3: Event marker lists.

Mon. Only Working With Event Markers - *Monitoring Mode only*

Saving Custom Markers

At any point, when one of the event marker lists is on the screen, the user has the option to enter a custom marker by selecting this choice from the list. Custom markers are to be used for unexpected events which have not been preconfigured in the lists. When **Custom Marker** is selected a pop up menu will appear (Figure 1) allowing the user to type in a custom name and/or marker state. Once a custom marker has been saved, it will appear in the list for the remainder of the examination to allow it to be used more than once.

Editing Event Markers

It is possible to edit any saved user defined event in the event list by right clicking on the event and selecting **Edit Event** out of the menu (Figure 2). An edit marker list will appear (Figure 3) from which the user can choose a different marker or use the **Edit Marker** function to enter a custom marker name.

It is also possible to edit any saved user defined event by right clicking on the event in a curve window (Figure 4) and selecting **Edit Event** out of the menu (Figure 5).

Deleting Event Markers

It is possible to delete any saved user defined event in the event list by highlighting the event and pressing the delete key or right clicking on the event and selecting **Delete Event** out of the menu (Figure 2). After a prompt for confirmation, the event is deleted permanently from the list and the curve windows.

It is also possible to delete any saved user defined event by right clicking on the event in a curve window (Figure 4) and selecting **Delete Event** out of the menu (Figure 5).

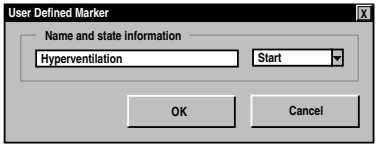


Figure 1: User Defined marker dialog.

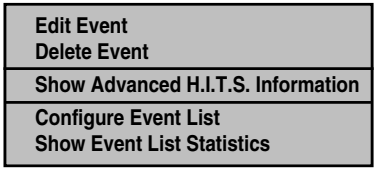


Figure 2: Right Click Event List Menu.

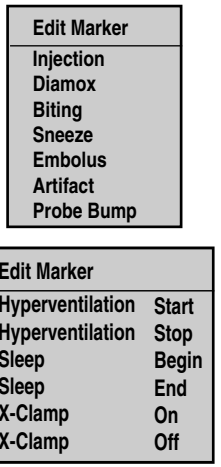


Figure 3: Edit marker lists.

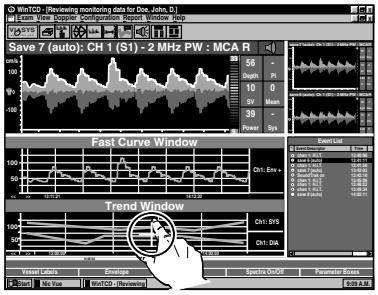


Figure 4: Right click on the saved event in the Trend window.

Figure 5: Right click Trend window menu (lower section).

Using the General Cursor Mode (Curve Displays)

In order to set cursors in the trend and fast curve display windows, the user must activate a special cursor mode. Inside of the General Cursor mode, there are four types of cursors available for the curve displays. These are Horizontal Curve, Differential Time, Vertical Curve, and Average Curve. The following pages describe these.

Activating the General Cursor Mode

The General Cursor Mode for a curve display can be switched on by:

1. Right clicking in either the trend display window or the fast curve display window.
2. Clicking on the function **General Cursors** (Figure 1).

Recognizing the General Cursor Mode

When the General Cursor Mode for a curve display window is active, the mouse pointer will change into a special cursor type pointer when the mouse is positioned in the data section of the trend or fast curve window. Depending on the type of cursor active, a different mouse pointer (Figure 2) will be active.

Selecting the Cursor Type

The type of cursor can be selected by:

1. Right clicking in the display window which has the general cursor mode active.
2. Clicking on the function **Select Cursor Type** (Figure 3).
3. Selecting the cursor type from the submenu. (Figure 4).

Deactivating the General Cursor Mode

The General Cursor Mode for a curve display can be switched off by:

1. Right clicking in the curve display window.
2. Clicking on the function **General Cursors Off** (Figure 3).

Note: See also the sections on **Calculate VMR** which follow these pages for information on a special type of cursor mode which allows the vasomotor reactivity to be manually calculated by setting cursors in the trend display.

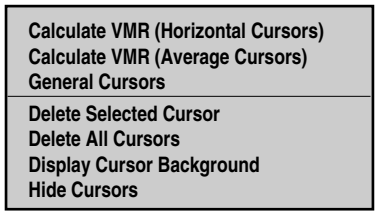


Figure 1: Trend and Fast Curve Window Right Click Menus.

Figure 2: Various Curve Cursor Mouse Pointers.

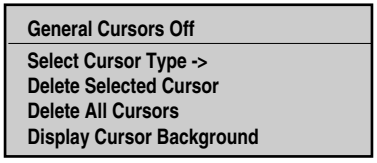


Figure 3: General Cursor Mode Right Click Menu.

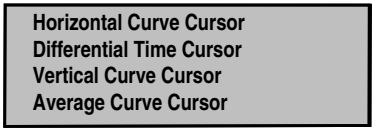


Figure 4: Cursor Type Menu.

Note: The general cursor mode must be activated on an individual window basis. If the general cursor mode is on for the trend window it will not automatically be on for the fast curves window, etc.

Setting Horizontal Curve Cursors

Horizontal Curve cursors are single line measurements which are made with respect to the 0 scale reference in either the trend or fast curves window (Figure 1). Since the displays can often have more than one scale, there is a 0 reference for each scale.

The Horizontal Curve cursors may be set to measure the value from any point on the display by:

1. Selecting the Horizontal Curve cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking on the first of **two points** where you want the line to begin and then holding down the Left mouse button.

3. Dragging the mouse until the other end of highlighted box is over the second point where the line should end and then releasing the mouse button.

The line is drawn and the cursor value with respect to the 0 reference is displayed (Figure 2).

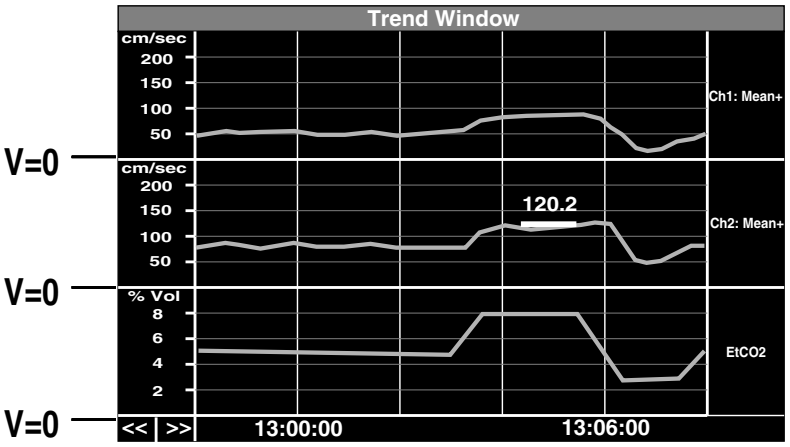


Figure 1: Horizontal Curve cursor measurements are made with respect to one of the 0 references.

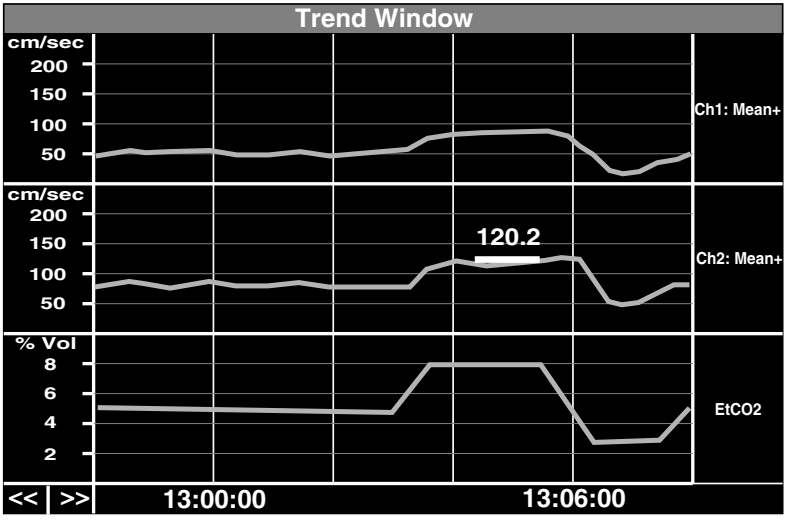


Figure 2: This example shows a single Horizontal Curve cursor.

Note: The Horizontal Curve cursors do not take into account the actual curve values. These cursors are purely display level values which the user eyeballs to the correct position. The Horizontal Curve cursors are saved along with the individual display curve and therefore can only be set when the curve display is configured for separate scales. See Configuring Separate Scales.

Setting Differential Time Cursors

Differential Time cursors are single value cursors which measure the time difference between any two points in either the trend or fast curves window (Figure 2). This method is very useful when making time delay or duration measurements.

The Differential Time cursors may be set by:

1. Clicking on the first of **two points** you want to measure and then holding down the Left mouse button (Figure 1).

2. Dragging the mouse until the highlighted box is over the second point and then releasing the mouse button (Figure 1).

An H-**Bar**' appears between the two points and the differential time value is displayed (Figure 2).

The units of measure for the differential time values are in minutes for the trend display and seconds for the fast curves display.

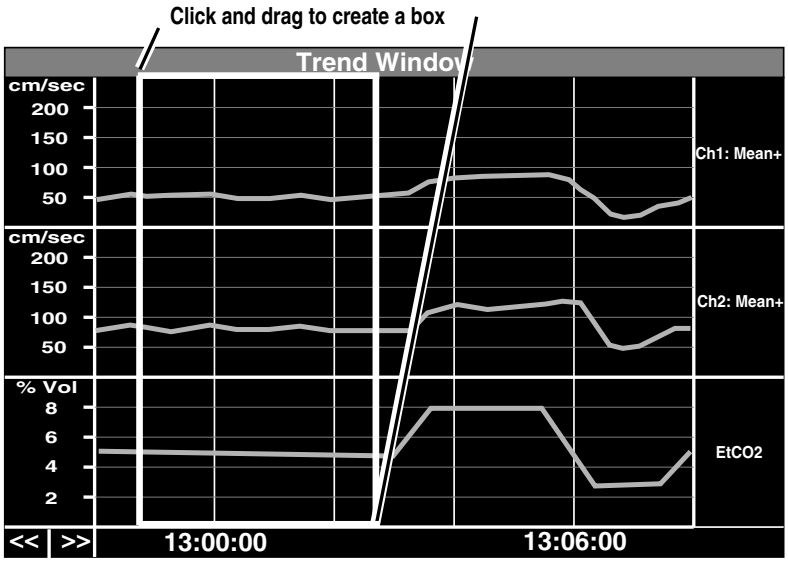


Figure 1: Trend Display - Setting a Differential Time Cursor.

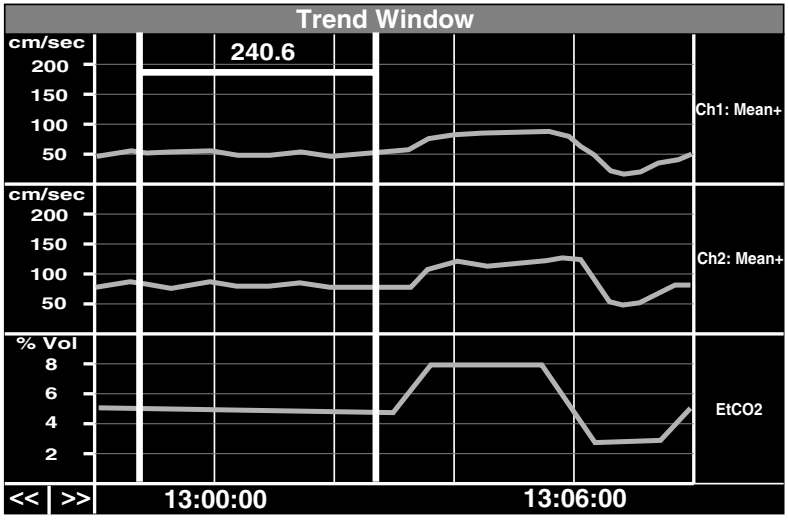


Figure 2: Trend Display - Differential Time Cursor.

Setting Vertical Curve Cursors

Vertical Curve cursors are multiple value cursors which display the value for each of the curves in the display at the particular time point of interest. The measurements are made with respect to the 0 scale references as was done with the Horizontal Curve cursors (Figure 1).

The Vertical Curve cursors may be set by:

Method 1

1. Selecting the Vertical Curve cursor type (as described previously) to get the appropriate mouse pointer.

2. Positioning the mouse pointer on the time position and then clicking the **Left** mouse button.

Method 2

1. Selecting the Vertical Curve cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking and holding down the **Left** mouse button over the curve data, then dragging the vertical cursor line to a new position, and releasing the button on the point of interest.

The line is drawn at the particular time point and the values are displayed using the curve colors (Figure 2).

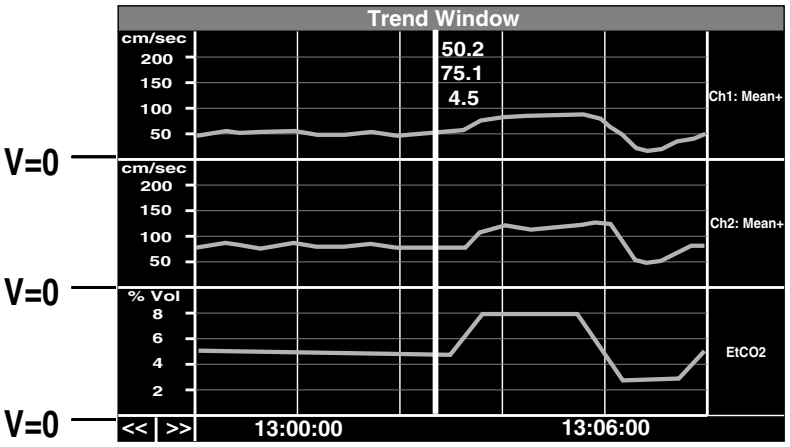


Figure 1: Vertical Curve cursor measurements are made with respect to the 0 references.

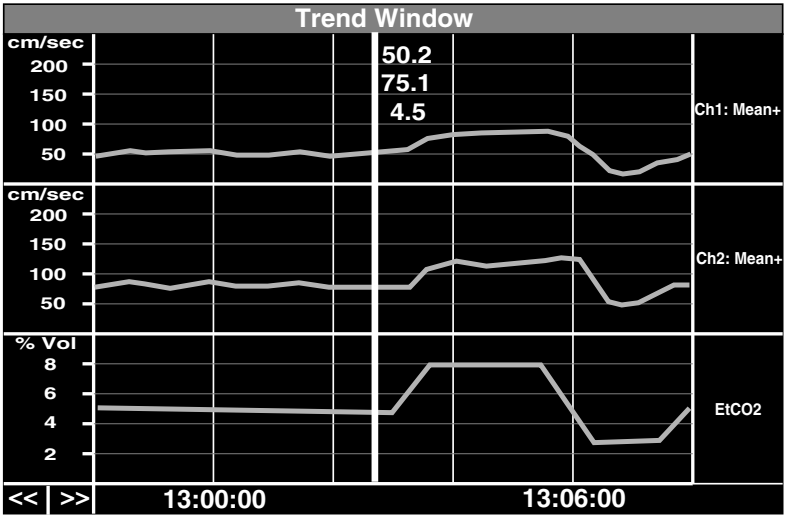


Figure 2: This example shows a single Vertical Curve cursor.

Setting Average Curve Cursors

Average Curve cursors are multiple value cursors which display an average value for each of the curves in the display between two time points of interest. The measurements are made with respect to the 0 scale references as was done with the Horizontal Curve cursors (Figure 1).

The Average Curve cursors may be set by:

1. Selecting the Average Curve cursor type (as described previously) to get the appropriate mouse pointer.

2. Clicking on the first of **two points** where you want the averaging to begin and then holding down the Left mouse button.

3. Dragging the mouse until the other end of highlighted box is over the second point where the averaging should end and then releasing the mouse button.

An H-**Bar**' appears defining the start and stop times of the segment to average over and the average values of each curve are calculated and displayed using the curve colors (Figure 2).

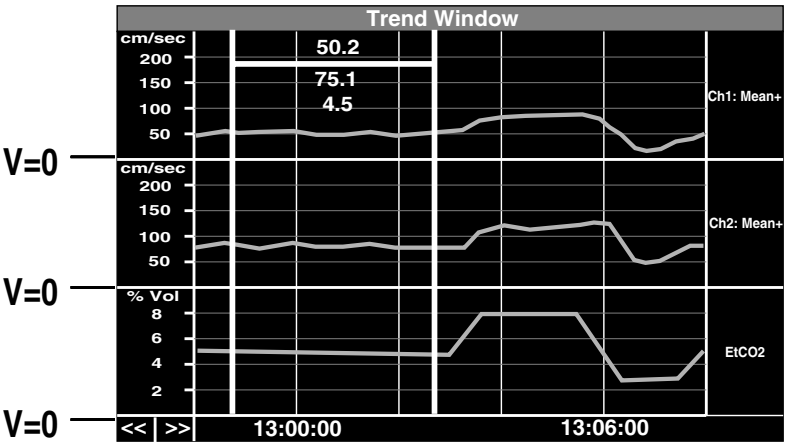


Figure 1: Average Curve cursor measurements are made with respect to the 0 references.

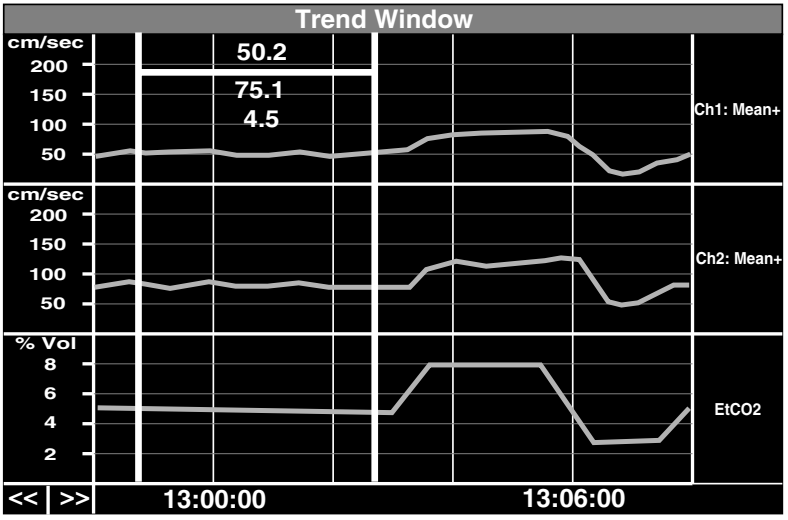


Figure 2: This example shows a single Average Curve cursor.

Working With Curve Cursors

This section describes the various functions which are available to edit the different types of curve cursors.

Moving Cursors

All the different types of curve cursors may be moved by clicking the left mouse button on a cursor, holding down the button and dragging the cursor to a new position, and then releasing the button.

Resizing Cursors

The average curve cursors and time differential cursors may be resized by first single clicking the left mouse button on a cursor to activate it and then clicking the mouse on one of the small resize handles (half way up the vertical boundary lines), holding down the button, dragging the boundary line to a new position, and then releasing the button.

The horizontal curve cursors may be resized by first single clicking the left mouse button on a cursor to activate it and then clicking the mouse on one of the small resize handles (at the ends of the line), holding down the button, dragging the end to a new position, and then releasing the button.

Deleting Individual Cursors

All the different types of curve cursors may be deleted by first single clicking the left mouse button on a cursor to activate it and then pressing the delete key or right clicking the mouse on the cursor and then selecting **Delete Selected Cursor** from the menu.

Deleting All Cursors

All the displayed curve cursors, irregardless of their type, may be deleted all at once from a trend or fast curve display by right clicking the mouse anywhere in the display data and then selecting **Delete All Cursors** from the menu.

Saving Cursors

The cursors may be saved by:

1. Click on **Configuration** (Figure 1).

2. Click on **Save Configuration**.

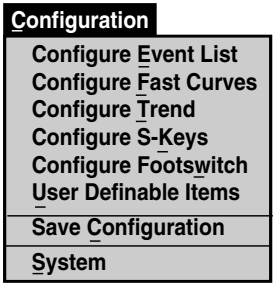


Figure 1: Click on Configuration and then on Save Configuration.

Clearing Cursor Background

At times the cursor values may be difficult to read if the numbers are written directly over the curve data. For this reason it is possible to clear the background data for the cursor value by right clicking the mouse anywhere in the curve display data and then selecting **Clear Cursor Background** from the menu. The background may be toggled back on by right clicking the mouse anywhere in the curve display data and then selecting **Display Cursor Background** from the menu.

Hiding Cursors

All the different types of curve cursors may be temporarily removed from the display by right clicking the mouse anywhere in the curve display data and then selecting **Hide Cursors** from the menu. The cursors may be toggled back on by right clicking the mouse anywhere in the curve display data and then selecting **Show Cursors** from the menu.

Note: The **Hide Cursors** and **Show Cursors** functions are only available when the General Cursor Mode is switched off.

Calculating the Vasomotor Reactivity (VMR)

The vasomotor reactivity (VMR), which is based on Ringelstein et al, can be calculated from the mean curve using three cursors (Horizontal curve cursors or Average curve cursors) in the trend display to define the areas of normocapnia, hypercapnia, and hypocapnia (Figure 1). In addition the calculation can be done in a simplified form only using two cursors (normocapnia and hypercapnia). This section describes how to make the calculation after the examination has been performed.

Activating the Calculate VMR Mode

The Calculate VMR Mode for the trend display can be activated by:

Method 1

1. Right clicking in the trend display window.

2. Clicking on either of the functions **Calculate VMR (Horizontal Cursors)** or **Calculate VMR (Average Cursors)** (Figure 2).

Method 2

1. Clicking on either of the s-key functions **Calculate VMR (H-Cursors)** or **Calculate VMR (A-Cursors)**.

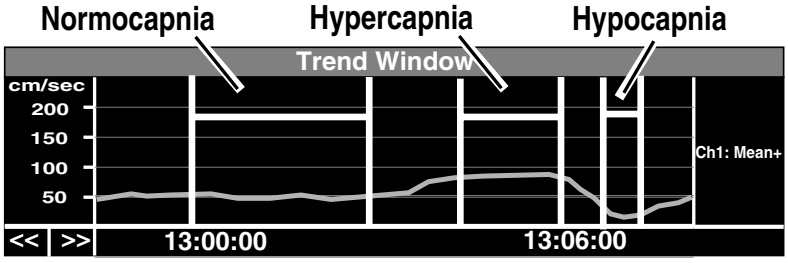


Figure 1: Vasomotor Reactivity (VMR) Phases.

Recognizing the Calculate VMR Mode

When one of the Calculate VMR Modes for the trend display window is active, the mouse pointer will change into a special cursor type pointer when the mouse is positioned in the data section of the trend window. Depending on the mode chosen (Horizontal cursors or Average cursors), a different mouse pointer (Figure 3) will be active.

In addition to the mouse pointer changing, the trend display will be redrawn with all event markers and non essential cursors removed.

Finally in the top left hand corner of the trend display, the letters **VMR** will be drawn for each mean curve in the trend display. The color of the text correlates with the mean curve colors. See Figure on next page.

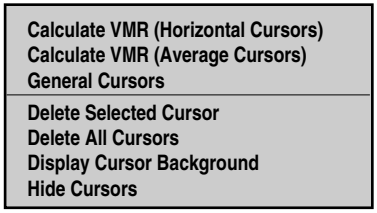


Figure 2: Trend Window Right Click Menu.

Figure 3: Calculate VMR Cursor Mouse Pointers.

Note: There are special factory default settings files (^Unilateral VMR (EME) and ^Bilateral VMR (EME)) which can be used for VMR examinations.

Note: While the Calculate VMR mode is active, the configuration functions for the trend display are disabled.

Note: The vasomotor reactivity (VMR) can only be calculated from mean curves.

Using Horizontal Curve Cursors to Calculate VMR

This section explains how Horizontal Curve cursors may be used to calculate the VMR.

Once the Calculate VMR (Horizontal Cursors) Mode is activated, it is possible to set either two or three cursors in one or more mean sections of the trend in a similar way to the general cursor mode explained previously.

The system constantly inspects the trend display to see if either 2 or 3 valid cursors for a mean curve have been set in the presently displayed trend time segment.

As soon as two valid Horizontal curve cursors are found in a mean curve section of the trend display, the system automatically calculates the VMR value for the curve with the following formula: VMR = 100 * (Vhyper – Vnorm) / Vnorm. The first cursor value is the Vnorm phase baseline value. The second cursor value is the Vhyper phase value. The starting time point of the cursors is used to decide which cursor is first.

If a third valid Horizontal cursor is set in a mean curve section of the trend display, the system calculates the VMR value with the following formula: VMR = 100 * (Vhyper – Vhypo) / Vnorm. The first cursor value is the Vnorm phase baseline value. The second cursor value is the Vhyper phase value. The third cursor value is the Vhypo phase value.

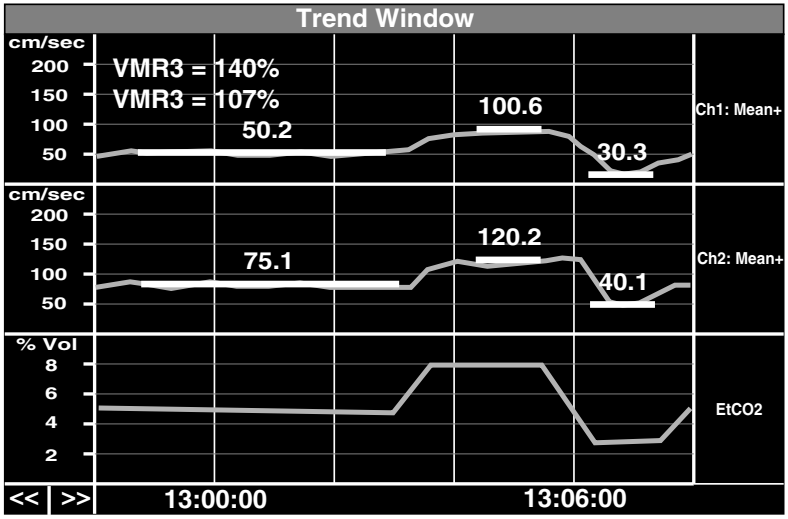


Figure 1: Calculating VMR using three Horizontal Curve cursors for each mean curve.

The system displays the VMR values for each mean curve in the top left of the trend display as a percent as shown in Figure 1 using the same color as the curve. Depending on whether the 2 or 3 cursor method was used, the text is **VMR2 =** or **VMR3 =**.

Note: For information on how to set Horizontal Curve cursors, please refer to the section *Setting Horizontal Curve Cursors*.

Note: See Section Description of Calculate VMR Mode for more detailed information on the functionality of the Calculate VMR mode.

Note: The Horizontal Curve cursors do not take into account the actual curve values. These cursors are purely display level values which the user eyeballs to the correct position. The Horizontal Curve cursors are saved along with the individual display curve and therefore can only be set when the curve display is configured for separate scales. See Configuring Separate Scales.

Using Average Curve Cursors to Calculate VMR

This section explains how Average Curve cursors may be used to calculate the VMR.

Once the Calculate VMR (Average Cursors) Mode is activated, it is possible to set either two or three cursors in the trend in a similar way to the general cursor mode explained previously.

The system constantly inspects the trend display to see if either 2 or 3 valid cursors for a mean curve have been set in the presently displayed trend time segment.

As soon as two valid Average curve cursors are found in the trend display, the system automatically calculates the VMR value for each mean curve with the following formula: VMR = 100 * (Vhyper – Vnorm) / Vnorm. The first cursor value is the Vnorm phase baseline value. The second cursor value is the Vhyper phase value. The starting time point of the cursors is used to decide which cursor is first.

If a third valid Average cursor is set in the trend display, the system calculates the VMR value for each mean curve with the following formula: VMR = 100 * (Vhyper – Vhypo) / Vnorm. The first cursor value is the Vnorm phase baseline value. The second cursor value is the Vhyper phase value. The third cursor value is the Vhypo phase value.

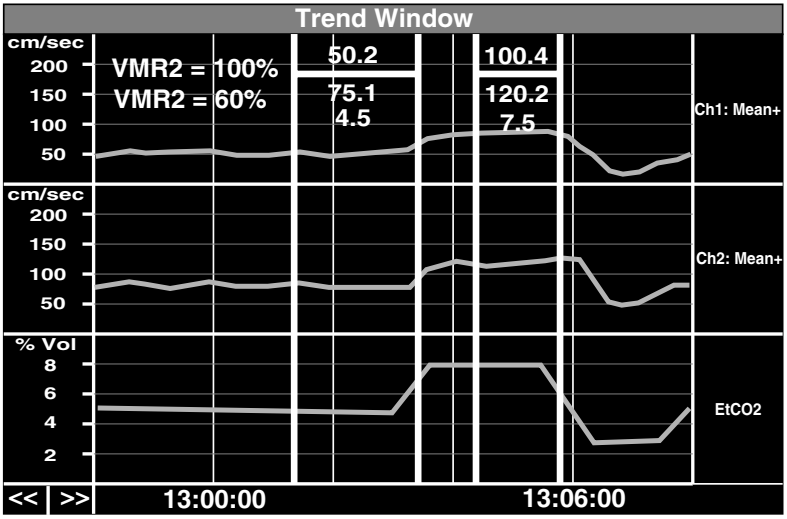


Figure 1: Calculating VMR using two Average Curve cursors.

The system displays the VMR values for each mean curve in the top left of the trend display as a percent as shown in Figure 1 using the same color as the curve. Depending on whether the 2 or 3 cursor method was used, the text is **VMR2 =** or **VMR3 =**.

Note: For information on how to set Average Curve cursors, please refer to the section *Setting Average Curve Cursors*.

Note: See Section Description of Calculate VMR Mode for more detailed information on the functionality of the Calculate VMR mode.

Description of Calculate VMR Mode

During the time that the system does not have the correct number of cursors, too many cursors have been set, or two or more cursors have exactly the same start time, the VMR values are displayed as **???** (Figure 1).

If the trend display is paged or updated when the VMR calculation is written on the display, the displayed text remains but the values may be set to new values or **???** depending on whether the cursors are still validly displayed.

The calculation only works for cursors actually displayed in the trend. This applies to all types of trend redraws (new trend time base, paging, etc.). Depending on the number of cursors shown, the 2 or 3 cursor method is automatically used.

When a VMR Calculate mode is on and pertinent cursors are deleted from the trend display which are needed for the VMR calculation, the VMR calculate mode remains on but this results in the values being drawn as **???** (Figure 1) until the user redoes the cursors.

If pertinent cursors are moved in the trend display which are needed for the VMR calculation, then the values recalculate automatically if the new position is valid for the calculation. If the new position is not valid (different curve section, etc.), then the move is not allowed and the cursor is returned to its original position.

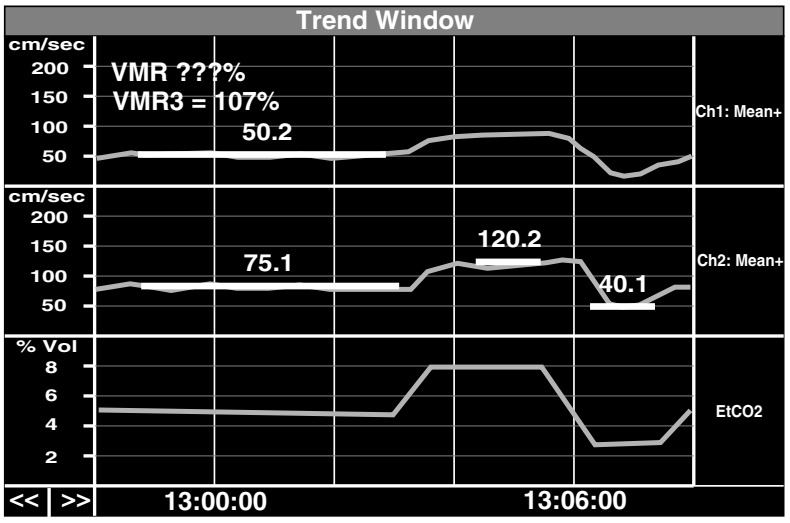


Figure 1: Invalid VMR Calculation for Channel 1.

If the text for the VMR calculation interferes with the cursors, the user will need to page the trend display slightly or use a longer time scale.

Note: See Section Working With Curve Cursors for more detailed information on the functionality of setting and editing cursors.

Note: The cursor values and the resulting VMR values are subject to rounding errors at times. The values used in the formulas are often of higher precision than those of the displayed cursor values which are rounded off.

Documenting the VMR Results

The documentation for the VMR test is a printout of the trend display when the VMR values are on the screen. The trend display can be printed out by:

1. Right clicking in the trend display window.
2. Clicking on **Print Curves** (Figure 1).

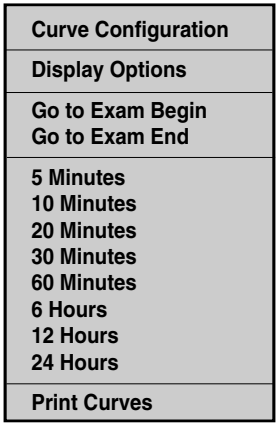


Figure 1: Trend Display Right Click Menu.

Deactivating the Calculate VMR (Horizontal Cursors) Mode

The Calculate VMR (Horizontal Cursors) Mode for the trend display can be switched off by:

Method 1

1. Right clicking in the trend display window.
2. Clicking on the function **Calculate VMR (Horizontal Cursors) Off** (Figure 2).

Method 2

1. Clicking on the s-key function **Calculate VMR (H-Cursors).**

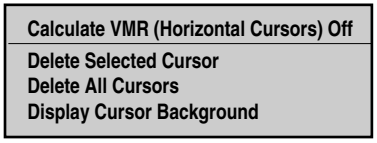


Figure 2: Calculate VMR (Horizontal Cursors) Mode Right Click Menu.

Deactivating the Calculate VMR (Average Cursors) Mode

The Calculate VMR (Average Cursors) Mode for the trend display can be switched off by:

Method 1

1. Right clicking in the trend display window.
2. Clicking on the function **Calculate VMR (Average Cursors) Off** (Figure 3).

Method 2

1. Clicking on the s-key function **Calculate VMR (A-Cursors).**

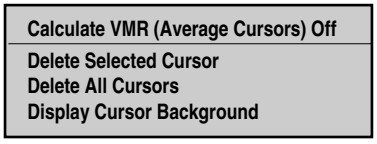


Figure 3: Calculate VMR (Average Cursors) Mode Right Click Menu.

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Chapter S9
Mon. Only Creating Monitoring Settings Files

Creating a new Settings file **S9-3**
Assign the probe(s) and channel(s) S9-3
Set the parameters and window sizes S9-4

Creating a new default Settings file **S9-5**

Renaming a Settings file **S9-6**

Deleting a Settings file **S9-7**

This chapter describes how to create a new Settings file, delete an existing Settings file, create a new default Settings file, and rename a Settings file.

For instructions on choosing an existing Monitoring Settings File, please refer to ***Choose the monitoring mode settings*** in *Chapter S5* of this guide.

For setting the system language that will be displayed on the screen, see ***Language options tab*** in the *NicVue Reference Guide*. See the Window's NT Regional Settings for setting the system language to German.

Legends

Diag. Only Designates Diagnostic Mode only.

Mon. Only Designates Monitoring Mode only.

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Creating a new Settings file

A Settings file contains various (default) settings which, when selected, automatically sets the previously defined system parameters. This helps reduce the amount of setup time.

Note: Transducers must be attached to the system in order to create settings.

Assign the probe(s) and channel(s)

Use this procedure to assign connected probes to the intended channel(s).

1. Click on **Settings** (Figure 1).
2. Click on **Create a New Setting**.
3. Click on the **Enable** button(s) (Figure 2) accordingly for the probe you want to assign to the channel(s) or select the number of depths (multidepth capability) wanted for the channel by clicking the small up/down arrows.
4. Choose the FFT resolution (Figure 2) by clicking on one of the three radio buttons. The FFT resolution defines the number of vertical points (bins) in the spectral display. The higher the FFT resolution, the finer the frequency resolution of each bin will be. In multi-channel applications, a lower FFT resolution will allow faster spectral sweep speeds.
5. If 8 depths are selected, choose whether you want an M-Mode display by checking the box.
6. Click on **Load** (Figure 2).

Note: A channel selection can be deselected by clicking on the Disable button.

Note: If an M-Mode display is added, please refer to Chapter S16 in this guide for all the details on using the M-Mode display.

Note: Refer to Chapter S17 in this guide for additional information on creating special settings to record or playback audio data from a DAT tape or to use the Continuous SoundTrak option, which records all the audio data in digital format.

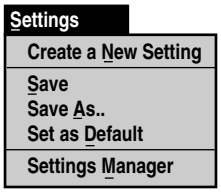

Figure 1: Click on Settings and then on Create a New Setting.

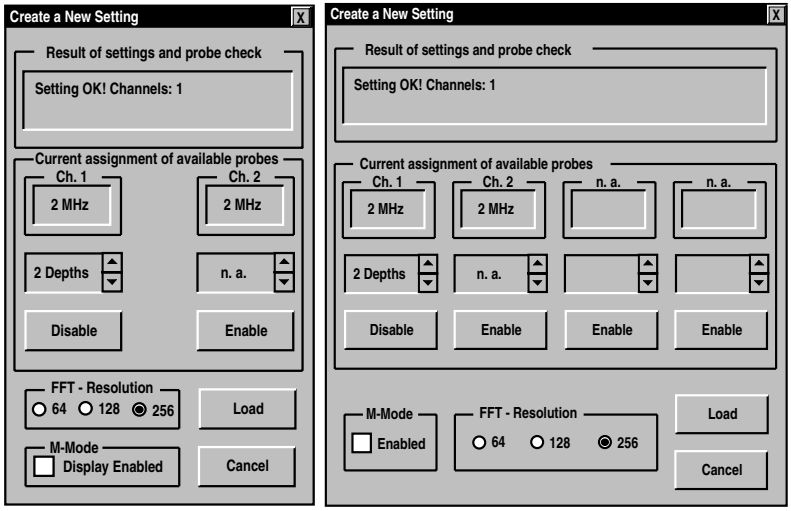

Figure 2: Assign the connected probes to the desired channels or select the number of depths each and then click on Load (Companion III and Pioneer TC8080 examples shown).

Set the parameters and window sizes

Choose the various parameter settings and resize the windows as desired.

The following items can be configured:

- Sweep speed
- Depth
- Scale
- Zero line
- Gain
- Doppler parameter boxes
- Number of Doppler channels
- Number of multidepths
- MD Channel Linkage
- External analog curves
- Fast curve display and curves
- Trend display and curves
- H.I.T.S. indicator settings
- Screen layout
- Amplitude
- Filter
- Direction
- Sample
- Probe frequency and mode
- Display events configuration
- Freeze window settings
- Review window settings
- S-key configuration settings
- Footswitch settings
- Vessel labels for each channel
- Spectral display range
- Spectral scale units
- Envelope curve settings
- Boost mode settings
- Tx/Rx Linkage
- All M-Mode related settings
- External connections
- Continuous SoundTrak
- Squelch
- Flow Separation
- Noise Reduction

1. Set the system parameters as desired to meet your exam requirements using the normal user interface for those functions.

2. Click on **Settings** (Figure 1).

3. Click on **Save** or **Save As**.

4. Type in the **file name** you want to identify the Settings file and then click on **OK** (Figure 2).

The newly created Settings Manager file will appear on the Settings menu (Figure 3) which is displayed by clicking on **Settings** and then on **Settings Manager**.

Note: The settings files created for the Pioneer TC8080 system will receive the file extension .ST3 or .ST7 and those created for the Companion III system will receive the file extension .ST5 or .ST8. These are located in the C:\Nicolet\WinTCD\Settings directory.

Note: The Companion III LE model is limited to a maximum of four receiving depths instead of the normal eight.

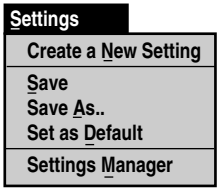

Figure 1: Click on Settings and then on Save.

Figure 2: Type the new file name and then click on OK.

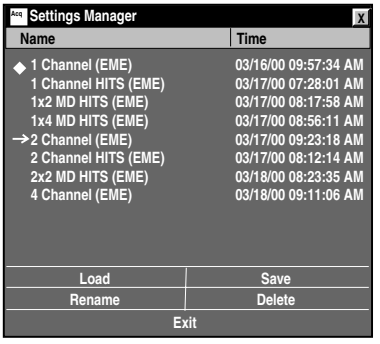

Figure 3: The newly created Settings file will appear on the Settings menu.

Creating a new default Settings file

You can choose to make a Settings file the default. Then, each time a new exam is started, the system will automatically select the system parameters saved in that file. For example, if the default Settings file has the Depth parameter set to 38, the system automatically sets the Depth to 38 each time the acquisition mode is started.

Method 1

1. Either create a new Settings file (*see previous page*) or open an existing Settings file (*Chapter S5*) that you want to become the default file.

2. Click on **Settings** (Figure 1).

3. Click on **Set as Default**.

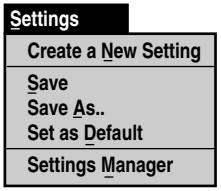

Figure 1: Click on Settings and then click on Set as Default.

Renaming a Settings file

If you wish, you may rename an existing Settings file using either of the methods on this page. The system parameter settings saved in the file will remain unchanged.

Note: Default and Read Only Settings files cannot be renamed or deleted without confirming the change one additional time.

Method 1

1. Click on **Settings** (Figure 1) and then on **Settings Manager**.

-or-

1. Click on the **Settings Manager** button.

2. Click on the **Settings file** you want to rename and then click on **Rename** (Figure 2).

3. Type in the **new file name** and then click on **OK** (Figure 3).

4. Click on **Exit** (Figure 2).

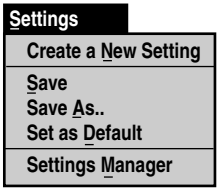

Figure 1: Click on Settings and then click on Settings Manager.

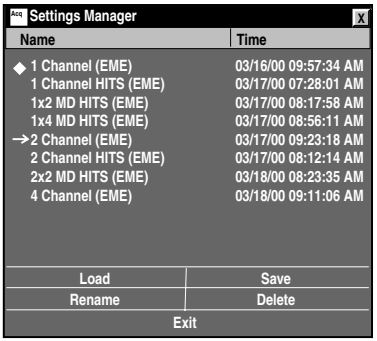

Figure 2: Click on the Settings file you want to rename and then click on Rename.

Figure 3: Type in the new name and then click on OK. Return to Figure 2 and click on Exit.

Deleting a Settings file

If you no longer need a Settings file and wish to delete it, you can use either of the following methods to delete that Settings file.

CAUTION

Make sure you choose the correct Settings file for deletion. Once it has been deleted, it can not be recovered unless it was backed up on a separate storage device.

Note: You cannot delete factory supplied settings, Read Only Settings, or Default Settings files without confirming the action one additional time.

Note: Refer to Chapter S12 in this guide for information on backing up and restoring configuration files.

Method 1

1. Click on **Settings** (Figure 1) and then on **Settings Manager**.

-or-

1. Click on the **Settings Manager** button.

2. Click on the **Settings file** you want to delete, and then click on **Delete** (Figure 2).

3. Click on **OK** (Figure 3).

4. Click on Exit (Figure 2).

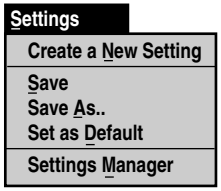

Figure 1: Click on Settings and then click on Settings Manager.

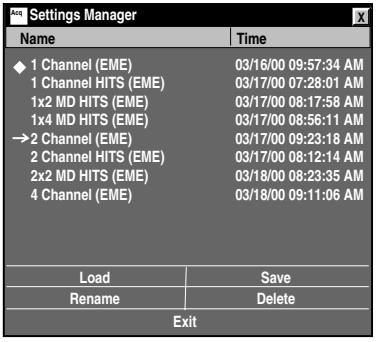

Figure 2: Click on the Settings file you want to delete and then click on Delete.

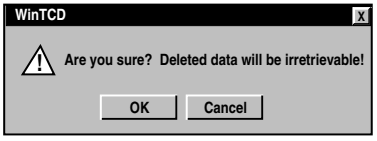

Figure 3: Click on OK. Return to Figure 2 and click on Exit.

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Chapter S10
Creating Diagnostic Protocols

Creating a new protocol **S10-3**
Choose the common (global) protocol settings S10-4
Choose the probe S10-5
Create the protocol step S10-6

Editing a protocol **S10-8**
Selecting a different probe S10-8
Adding new steps S10-9
Inserting a new step S10-9
Editing a step S10-9
Deleting a step S10-9
Adding/inserting/editing a step S10-10
Editing the common (global) protocol settings S10-11

Saving the edited protocol **S10-13**
Overwriting the original protocol S10-13
Creating a new protocol S10-13

Creating a new default protocol **S10-14**

Loading the default protocol **S10-14**

Renaming a protocol file **S10-15**

Deleting a protocol file **S10-16**

This chapter describes how to create new Diagnostic protocols which then can be selected to quickly set up your system for Diagnostic acquisitions.

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Creating a new Protocol

You can create a new protocol which contains steps you design, such as probe type, Doppler parameters such as Depth, etc. The following procedure creates a new Protocol from scratch. If you wish, you can edit an existing Protocol and then save it under a different name to save time (see ***Saving the edited Protocol*** later in this chapter).

1. Click on **Protocol** (Figure 1).

2. Click on **Create a New Protocol**.

3. If the Query panel *There is already an active Protocol loaded and running. Do you want to continue?* appears, click on **Yes** (Figure 2).

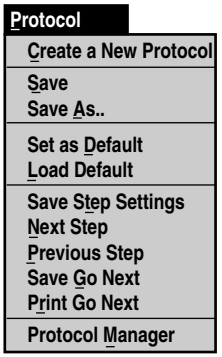


Figure 1: Click on Protocol and then on Create a New Protocol.

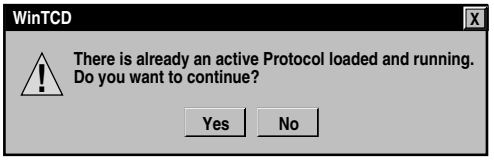


Figure 2: Click on Yes to continue.

Choose the common (global) Protocol settings

4. Click on the **Opt.** button (Figure 1).

5. In the Comments/Description text entry box, type in a short **description** of the protocol for future reference (Figure 2).

6. Choose which **function(s)** you want to enable by clicking on (checkmarking) the corresponding checkboxes.

   - **SoundTrak On when protocol is started**: Checkmark if you want SoundTrak to turn on automatically when you start the protocol.

   - **Search probe at any available socket**: Checkmark to search the sockets (starting with socket 1) until the system locates the probe defined in the current protocol step. Leave the checkbox empty if the defined probe type must be plugged into the correct socket as defined in the current protocol step.

   - **FFT Resolution**: Choose by clicking on one of the three radio buttons. The FFT resolution defines the number of vertical points (bins) in the spectral display. The higher the FFT resolution, the finer the frequency resolution of each bin will be.

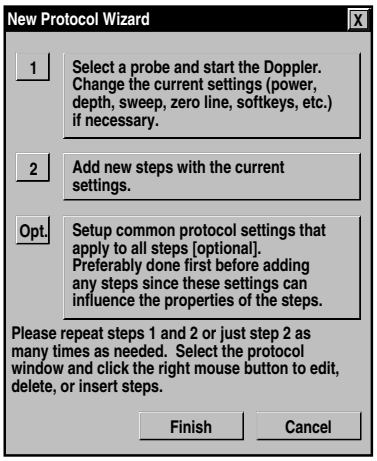

New Protocol Wizard
1
Select a probe and start the Doppler. Change the current settings (power, depth, sweep, zero line, softkeys, etc.) if necessary.
2
Add new steps with the current settings.
Opt.
Setup common protocol settings that apply to all steps [optional]. Preferably done first before adding any steps since these settings can influence the properties of the steps.
Please repeat steps 1 and 2 or just step 2 as many times as needed. Select the protocol window and click the right mouse button to edit, delete, or insert steps.
Finish
Cancel

Figure 1: Click on the Opt. button.

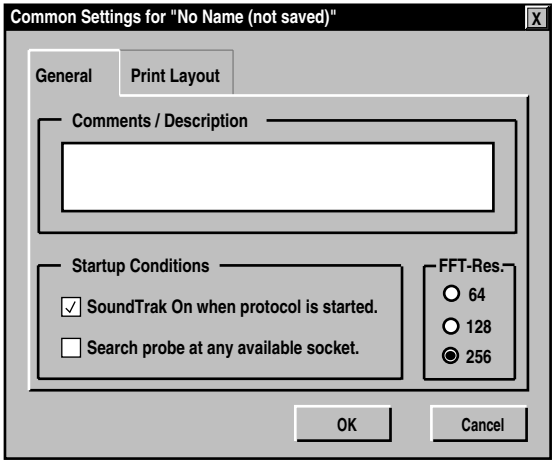


Figure 2: Click on (checkmark) the checkboxes for those options you want to enable for the protocol.

Note: Always perform the "Opt." step first in order to set up the common (global) settings which will be applied to all of the Protocol steps.

7. Click on the **Print Layout** tab (Figure 1).

8. Click on the **Layout Matrix** radio button that corresponds with the desired number of **Columns** and **Rows** for the report in which you want to place the Saved Spectral displays.

9. Click on the **Color** or **Grayscale** radio button accordingly for the type of printout you want.

10. Checkmark the **Left / Right** exchange box in the text report section of the display to configure the text report to print left side vessels on the right side of the report printout and visa versa. Leaving this box unchecked will print left side vessels on the left side of the report printout and right side vessels on the right side of the report printout.

11. Click on **OK**.

Choose the probe

12. Click on the **1** button (Figure 2).

13. Click on the **Socket #** button corresponding to the probe you want enabled for use during the exam (Figure 3).

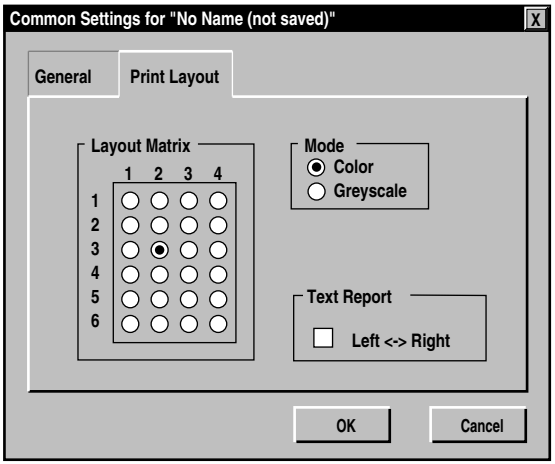


Figure 1: Click on the Print Layout tab, choose the number of columns and rows in the report for the saved spectral displays and whether you want color or grey scale prints. Click on OK when finished.

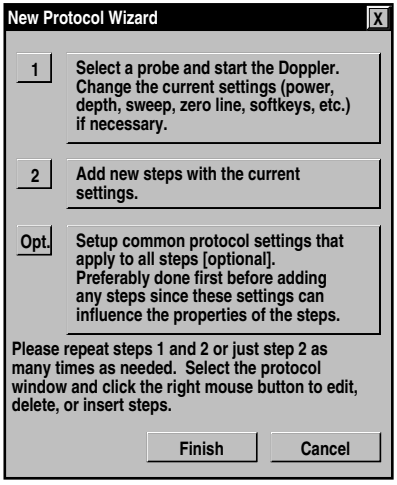

New Protocol Wizard
1
Select a probe and start the Doppler. Change the current settings (power, depth, sweep, zero line, softkeys, etc.) if necessary.
2
Add new steps with the current settings.
Opt.
Setup common protocol settings that apply to all steps [optional]. Preferably done first before adding any steps since these settings can influence the properties of the steps.
Please repeat steps 1 and 2 or just step 2 as many times as needed. Select the protocol window and click the right mouse button to edit, delete, or insert steps.
Finish
Cancel

Figure 2: Click on the 1 button.

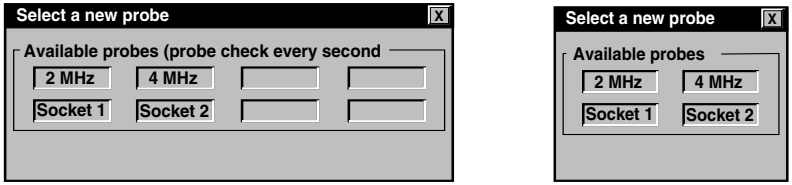


Figure 3: Click on the Socket # button associated with the transducer you want to use (Pioneer TC8080 and Companion III examples).

14. Using the Remote Control, adjust the Doppler settings you want to use for the first Protocol step you are now creating.

Create the protocol step

15. Click on the 2 button (Figure 1).

16. Click on the **Vessel name** show menu Arrow button and then click on the desired **Vessel name** from the list of options (Figure 2).

17. Click on the **Side** show menu Arrow button and then click on the desired option: Left, Right, None.

18. If desired, type in a short **comment/description** for that step.

19. If you want to include the spectral record in your report, click on (checkmark) the **Print step in report** check box.

20. Using the Up/Down Arrow buttons, choose on which **page**, **row**, and **column** you want the spectral record to appear.

21. In the **Select for save** box, click on the All Params, Rel. Depth, or Vessel only radio button.

    - **All Params**: All the relevant Doppler and DSP settings are saved and later recalled when loading the protocol step. This option is also referred to as a **Complete step**.

    - **Rel. Depth**: Relative Depth steps are protocol steps where only a relative depth adjustment setting is saved. When loading a Relative Depth step, the system uses all the Doppler settings presently active from the previous protocol step, but adjusts the Depth Up or Down by the amount of mm you will select in **Step 22**.

    - **Vessel only**: All the settings presently active are used and only the vessel label for the protocol step is altered.

22. If you selected **Rel. Depth** in the previous step, click on the ***Relative Depth*** Up/Down arrow buttons until the desired **depth change (in mm)** is displayed. The system will then adjust the Depth setting from the previous step up or down by the value you choose here.

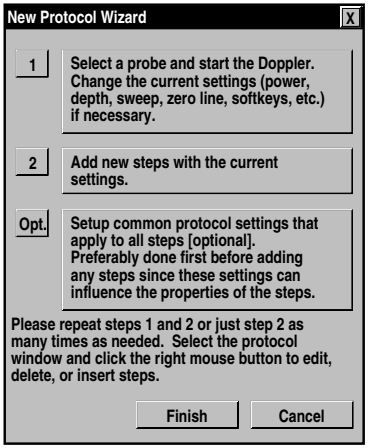

New Protocol Wizard
1
Select a probe and start the Doppler. Change the current settings (power, depth, sweep, zero line, softkeys, etc.) if necessary.
2
Add new steps with the current settings.
Opt.
Setup common protocol settings that apply to all steps [optional]. Preferably done first before adding any steps since these settings can influence the properties of the steps.
Please repeat steps 1 and 2 or just step 2 as many times as needed. Select the protocol window and click the right mouse button to edit, delete, or insert steps.
Finish
Cancel

Figure 1: Click on the 2 button.

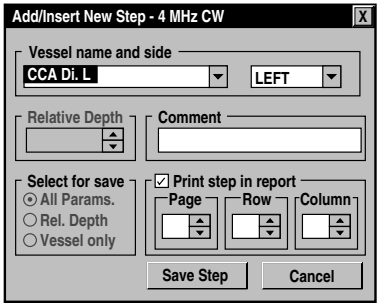


Figure 2: Make your selections on the Add/Insert New Step panel and then click on Save Step.

Note: The first step for a new probe must be a complete step. The system will limit the choice automatically.

---

23. Select **Save Step** to save all the parameters for the new protocol step. A line will be added to the protocol list window with the main information for the step.

24. Repeat starting at **step 12** if you want to select a different probe or repeat from **step 14** if you want to use the same probe for the next Protocol step.

25. When all required steps have been added to the new Protocol, click on **Finish** (Figure 1).

26. Click on **Yes** (Figure 2).

27. Type in the **name** with which you want to label the new Protocol (Figure 3).

28. The system saves the new Protocol.

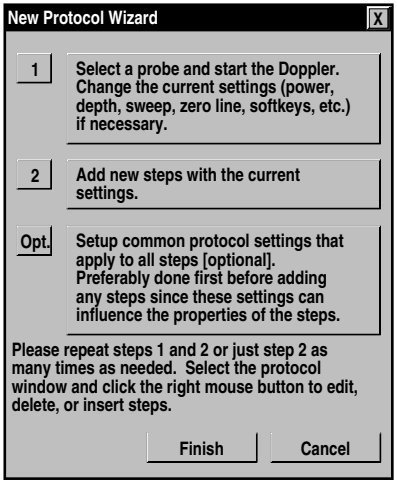

New Protocol Wizard
X
1
Select a probe and start the Doppler. Change the current settings (power, depth, sweep, zero line, softkeys, etc.) if necessary.
2
Add new steps with the current settings.
Opt.
Setup common protocol settings that apply to all steps [optional]. Preferably done first before adding any steps since these settings can influence the properties of the steps.
Please repeat steps 1 and 2 or just step 2 as many times as needed. Select the protocol window and click the right mouse button to edit, delete, or insert steps.
Finish
Cancel

Figure 1: Click on the Finish button.

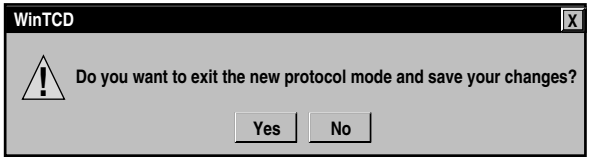


Figure 2: Click on Yes to save the new protocol.

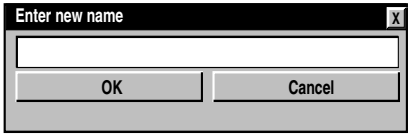


Figure 3: Type in a name for the new Protocol and then click on OK.

Editing a Protocol

The Protocol List window (Figure 1) displays the steps which comprise the selected protocol. You can edit the selected Protocol as necessary to fit your requirements.

Note: The Protocol List window is always displayed on the screen unless the Spectral window is increased to its maximum height or the Event list is increased to its maximum width.

Note: Each time a protocol step is edited, be sure to save the changes to the step by using the function Save Step Settings.

Selecting a different probe

Use this procedure to select a different probe connected to your system.

Method A

1. Click on **Doppler** (Figure 2).
2. Click on **Probe**.
3. Choose the new probe by clicking on the corresponding **Socket #** (Figure 3).

Method B

1. Press the **Probe** button on the Remote Control (Figure 4).
2. Choose the new probe by clicking on the corresponding **Socket #** (Figure 3).

Method C

1. Press the **Probe** button in the toolbar.
2. Choose the new probe by clicking on the corresponding **Socket #** (Figure 3).

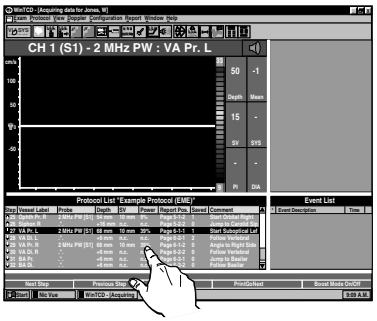


Figure 1: The Protocol List window.

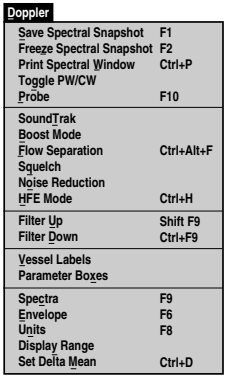


Figure 2: Click on Doppler and then on Probe.

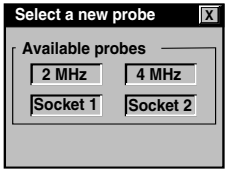


Figure 3: Click on the Socket # button that corresponds to the probe you want to use (Companion III example).

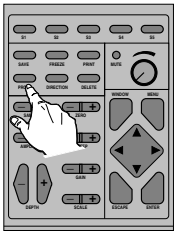


Figure 4: Press the Probe button.

Adding New Steps

This procedure will add a new step at the end of the current list of protocol steps.

1. Right click anywhere inside the **Protocol List window** (Figure 1).
2. Click on **Add New Step** (Figure 2).
3. Go to the next page.

Inserting a new step

Use this procedure to add a new step in front of the selected (highlighted) step.

1. Right click on the **step** in front of which you want to insert a new step (Figure 1).
2. Click on **Insert New Step Before Step #** (Figure 2).
3. Go to the next page.

Editing a step

Use this procedure to edit the active step.

1. Right click on the **step** that is highlighted in white (Figure 1). If the step you want to edit is not highlighted in white, use the **Next Step** and **Previous Step** commands in the Protocol menu or the associated softkeys (if assigned those functions) at the bottom of the window. A step must be active before you can edit it.
2. Click on **Edit Active Step** (Figure 2).
3. Go to the next page.

Deleting a step

Use this procedure to delete the selected (highlighted in blue) step. You may not delete the active step (highlighted in white). If the step you want to edit is not highlighted in blue, use the Arrow keys or click on the desired step.

1. Right click on the **step** you want to delete (Figure 1).
2. Click on **Delete Step #** (Figure 2).
3. When asked if you really want to delete the selected step number, click on **Yes**.

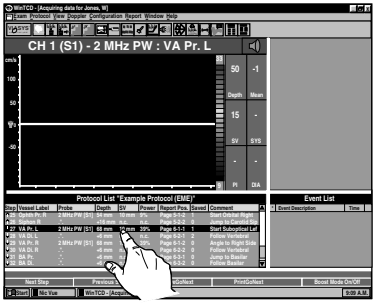


Figure 1: Right click anywhere in the Protocol List window.

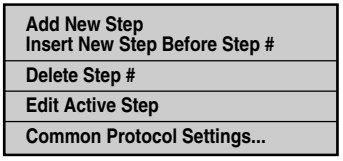


Figure 2: Click on the desired action.

Adding/inserting/editing a step

After completing the Add/Insert/ Edit steps on the previous page, perform the following steps to complete the task.

1. Click on the Vessel name and side dialog box to view a list of Vessel names and then click on the desired **vessel** (Figure 1).

2. Select the side; **Left**, **Right**, or **None**.

3. If desired, type in any **comments**.

4. If you want to include the step in your report (Figure 3), click on (checkmark) the **Print step in report** check window.

5. Choose whether you want to save **All Parameters**, **Relative Depth**, or **Vessel only** by clicking on the option's radio button.

6. Using the Up/Down Arrow buttons, select the **Relative Depth**.

7. Using the Up/Down Arrow buttons, choose on which **page**, **row**, and **column** you want the saved spectral display to appear (Figure 3). Only those saved records associated with steps set to **Print step in report** (step 4 above) will be included in the report.

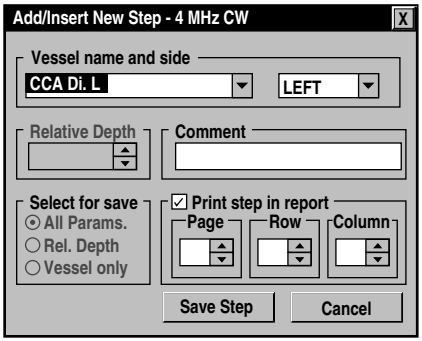


Figure 1: Make your selections on the Add/Insert New Step panel and then click on Save Step.

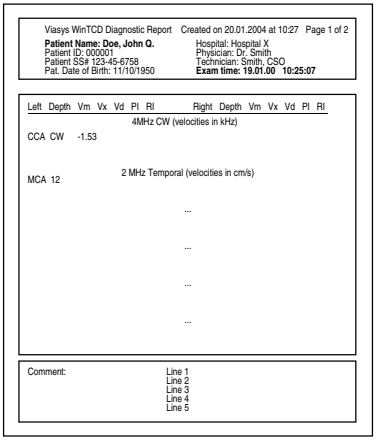


Figure 2: Text report page layout.

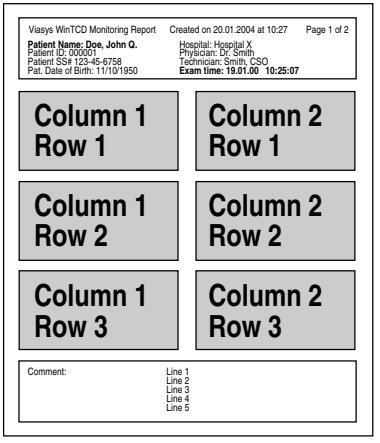


Figure 3: Graphics report page layout.

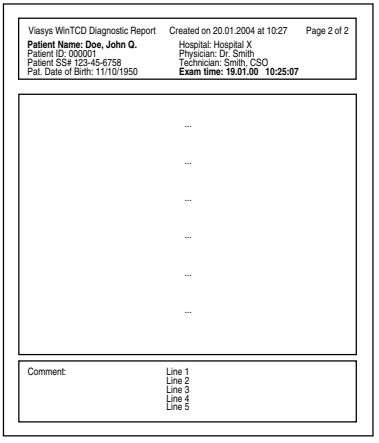


Figure 4: Conclusion report page layout. This page is printed automatically at the end of each report if configured.

Editing the common (global) Protocol settings

1. Right click anywhere inside the **Protocol List window** (Figure 1).

2. Click on **Common Protocol Settings** (Figure 2).

3. In the Comments/Description text entry box, type in a short description of the protocol for future reference (Figure 3).

4. Choose which function(s) you want to enable by clicking on (checkmarking) the corresponding checkboxes.

   - **SoundTrak On when protocol is started**: Checkmark if you want the SoundTrak to turn on automatically when you start the protocol.

   - **Search probe at any available socket**: Checkmark to search the sockets (starting with socket 1) until the system locates the probe defined in the current protocol step. Leave the checkbox empty if the defined probe type must be plugged into the correct socket as defined in the current protocol step.

   - **FFT Resolution**: Choose by clicking on one of the three radio buttons. The FFT resolution defines the number

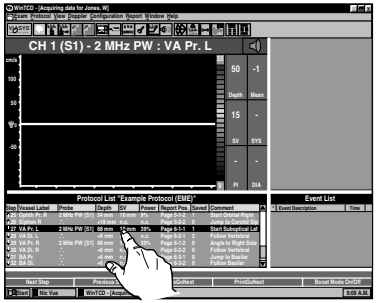


Figure 1: Right click anywhere in the Protocol List window.

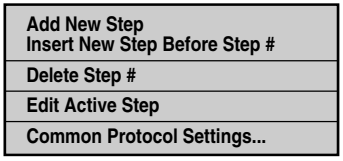


Figure 2: Click on Common Protocol Settings.

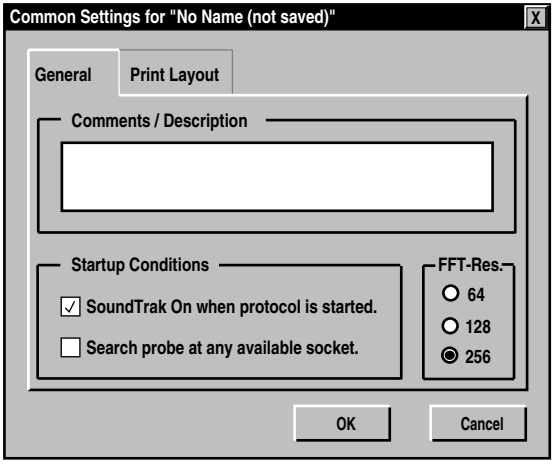


Figure 3: Click on (checkmark) the checkboxes for those options you want to enable for the protocol.

of vertical points (bins) in the spectral display. The higher the FFT resolution, the finer the frequency resolution of each bin will be.

5. Click on the **Print Layout** tab (Figure 1).

6. Click on the **Layout Matrix** radio button that corresponds with the desired number of **Columns** and **Rows** for the report in which you want to place the Saved Spectral displays.

7. Click on the **Color** or **Grayscale** radio button accordingly for the type of printout you want.

8. Checkmark the **Left / Right** exchange box in the text report section of the display to configure the text report to print left side vessels on the right side of the report printout and visa versa. Leaving this box unchecked will print left side vessels on the left side of the report printout and right side vessels on the right side of the report printout.

9. Click on **OK**.

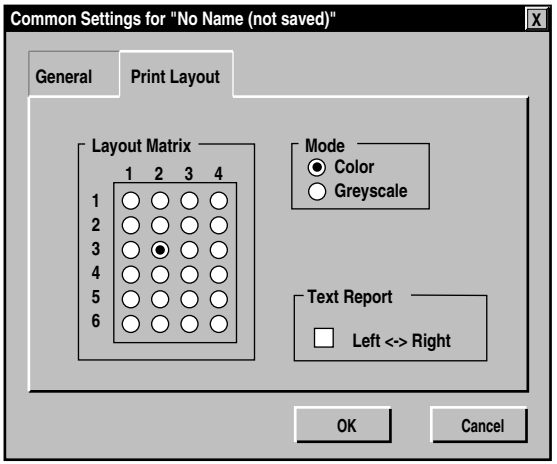


Figure 1: Click on the Print Layout tab, choose the number of columns and rows in the report for the saved spectral displays and whether you want color or gray scale prints. Click on OK when finished.

Saving the edited Protocol

After you have finished editing the Protocol, you can choose to overwrite the original Protocol with the edited one **- or -** create an entirely new Protocol and leave the original Protocol intact. Protocol files are appended with **.da3** / **.da7** (Pioneer) **or .da5** / **.da8** (Companion) automatically.

Table 1 shows which elements are saved to the Common Settings, Complete Steps, Relative Steps, and Vessel Label.

Overwriting the original Protocol

1. Click on **Protocol** (Figure 1).
2. Click on **Save**.

Note: If the existing protocol file is a "Read Only" file, you cannot overwrite the file. The system will force you to save the protocol under another name.

Creating a new Protocol

1. Click on **Protocol** (Figure 1).
2. Click on **Save As**.
3. Type in the new **Protocol file name** (Figure 2).
4. Click on **OK**.

Common Settings	Complete Steps	Relative Steps	Vessel Label only
Sound Trak	Transducer type and mode	Relative depth	Zero
Window sizes	Depth	Zero	Direction
Main window S-keys	Sample	Direction	Envelope
Footswitch settings	Amplitude	Envelope	Spectra On/Off
Freeze window size	Gain	Spectra On/Off	Units
Freeze window S-keys	Filter	Units	Spectral display range
Review window size	Scale	Spectral display range	Parameter boxes
Review window S-keys	Sweep	Parameter boxes	Vessel label and side
Search transducer at any socket	Boost level	Vessel label and side	Printout position
FFT Resolution	Zero	Printout position	
Report layout and color	Direction		
Text report side configuration	Envelope		
Event list column width	Spectra On/Off		
Squelch	Units		
Flow Separation	Spectral display range		
Noise Reduction	Parameter boxes		
	Vessel label and side		
	Printout position		
	Tx/Rx Linkage		
	HFE Mode and breakpoint		

Table 1

Creating a new default Protocol

This procedure will replace the current default Protocol with the active Protocol. You can have only one default Protocol at a time.

1. Click on **Protocol** (Figure 1).

2. Click on **Set as Default**.

Loading the default Protocol

Use this procedure to load the current default Protocol.

1. Click on **Protocol** (Figure 1).

2. Click on **Load Default**.

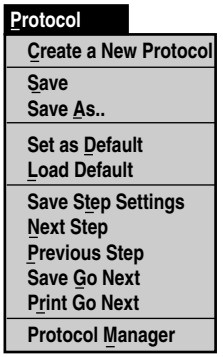


Figure 1: Click on Protocol to view the Protocol menu items.

Figure 2: Type in a name for the new Protocol and then click on OK.

Renaming a Protocol file

If you wish, you may rename an existing Protocol file using either of the methods on this page. The system parameter settings saved in the file will remain unchanged.

Note: Default and Read Only Protocol files cannot be renamed or deleted without confirming the change one additional time.

Method 1

1. Click on **Protocol** (Figure 1) and then on **Protocol Manager**.

-or-

1. Click on the **Protocol Manager** button.

2. Click on the **Protocol file** you want to rename and then click on **Rename** (Figure 2).

3. Type in the **new file name** and then click on **OK** (Figure 3).

4. Click on **Exit** (Figure 2).

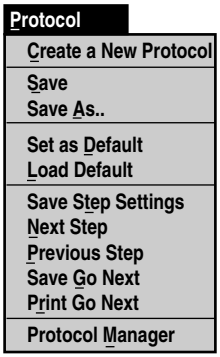


Figure 1: Click on Protocol and then click on Protocol Manager.

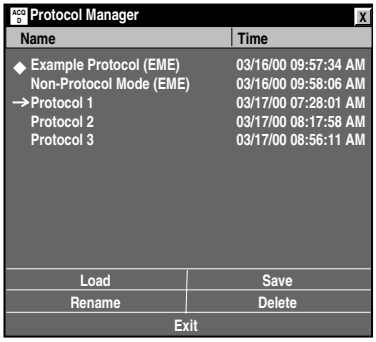


Figure 2: Click on the Protocol file you want to rename and then click on Rename.

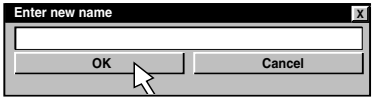


Figure 3: Type in the new name and then click on OK. Return to Figure 2 and click on Exit.

Deleting a Protocol file

If you no longer need a Protocol file and wish to delete it, you can use either of the following methods to delete that Protocol file.

CAUTION

Make sure you choose the correct Protocol file for deletion. Once it has been deleted, it can not be recovered unless it was backed up on a separate storage device.

Note: You cannot delete factory supplied Protocols, Read Only Protocols, or Default Protocol files without confirming the action one additional time.

Note: Refer to Chapter S12 in this guide for information on backing up and restoring configuration files.

Method 1

1. Click on **Protocol** (Figure 1) and then on **Protocol Manager**.

-or-

1. Click on the **Protocol Manager** button.

2. Click on the **Protocol file** you want to delete, and then click on **Delete** (Figure 2).

3. Click on **OK** (Figure 3).

4. Click on Exit (Figure 2).

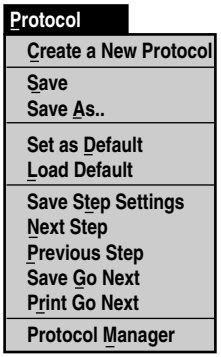


Figure 1: Click on Protocol and then click on Protocol Manager.

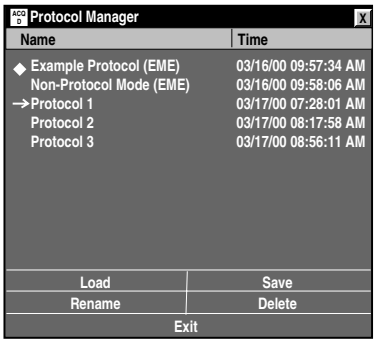


Figure 2: Click on the Protocol file you want to delete and then click on Delete.

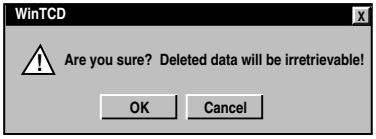


Figure 3: Click on OK. Return to Figure 2 and click on Exit.

Chapter S11
Viewing Multiple Window Screen Displays

Cascading multiple windows **S11-3**

Selecting a cascaded window for viewing S11-4

Tiling multiple windows horizontally **S11-5**

Tiling multiple windows vertically **S11-6**

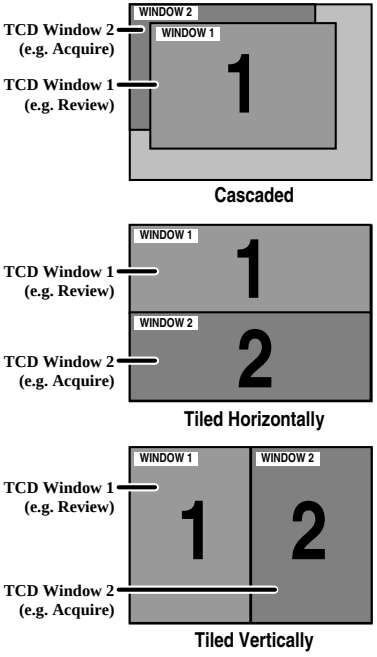
Maximizing a window **S11-7**

Minimizing a window **S11-8**

This chapter describes how to view multiple windows on the screen display.

- **Cascade Windows**
- **Tile Windows Horizontally**
- **Tile Windows Vertically**

The figure below shows the 3 possibilities for viewing multiple window screen displays.



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Cascading multiple windows

When multiple WinTCD windows are open on the screen display, you can cascade them which allows you to quickly choose a window for viewing (Figure 1).

Method 1

1. Click on **Window** (Figure 2).
2. Click on **Cascade**.
3. Go to the next page for instructions on selecting a window for viewing on the screen.

Method 2

1. Using the **Right** mouse key, click on the **bottom control bar** (Figure 3).
2. Click on **Cascade Windows** (Figure 4).
3. Go to the next page for instructions on selecting a window for viewing on the screen.

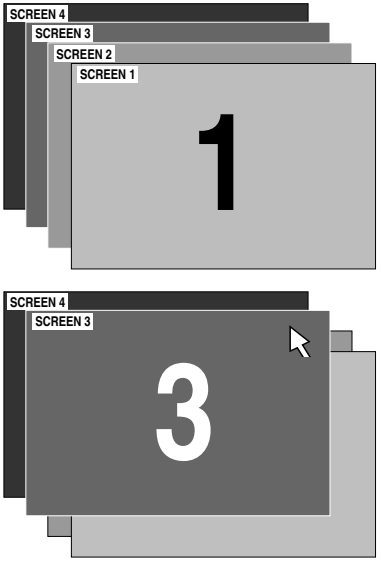

Figure 1: Cascading multiple WinTCD windows allows you to quickly select a window for viewing. In the top figure, Window 1 is currently in the front for viewing while in the lower figure, Window 3 has been moved to the front for viewing.

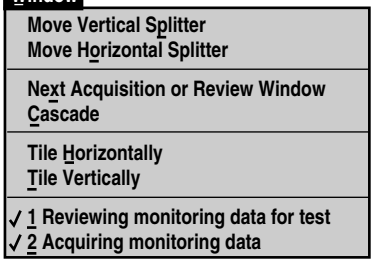

Figure 2: Click on Window and then on Cascade.

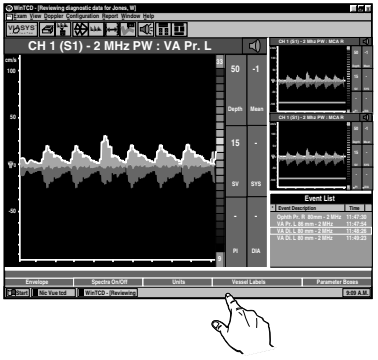

Figure 3: Click the Right mouse on the bottom control bar.

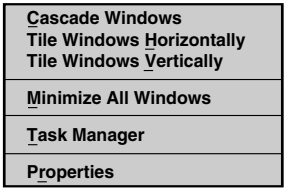

Figure 4: Click on Cascade Windows.

Selecting a cascaded window for viewing

You can use any of these methods to select a cascaded window for viewing.

Method 1

1. Click on the Title Bar of the **window** you want to bring forward for viewing (Figures 1 and 2).

Method 2

1. Click on the **Window menu** and then click on **Next Acquisition or Review Window** (Figure 3).

Also see **Maximizing a window** later in this chapter.

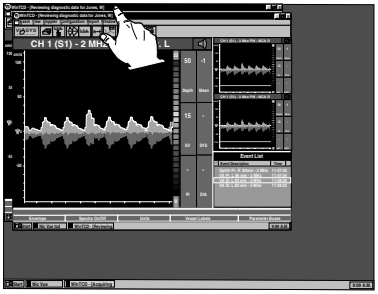

Figure 1: To bring (focus) the Doppler window forward for viewing as shown in Figure 2, click anywhere on that window.

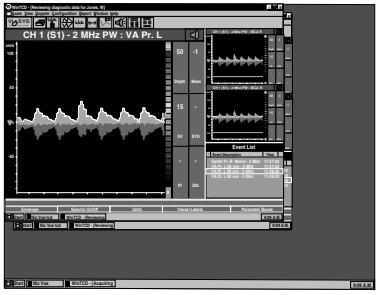

Figure 2: The window hidden in Figure 1 is now focused (brought into full view).

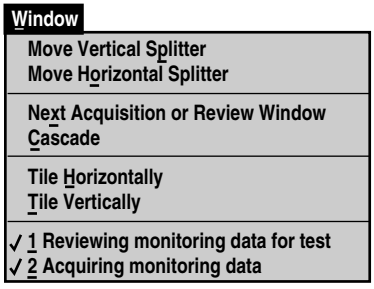

Figure 3: Click on Window and then on Next Acquisition or Review Window to bring the next window into view (focus).

Tiling multiple windows horizontally

When multiple windows are open on the screen display (Figure 1), you can choose to tile them horizontally so the windows can be viewed simultaneously. This feature is particularly useful for visually comparing two Doppler windows at the same time.

1. Click on the **Window menu** and then click on **Tile Horizontally** (Figure 2).

   The currently open windows are tiled horizontally on the screen display (Figure 3).

Also see **Maximizing a window** later in this chapter.

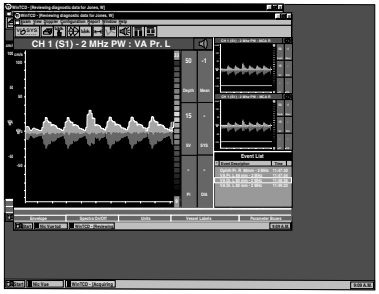

Figure 1: This example shows two Doppler windows cascaded on the screen display.

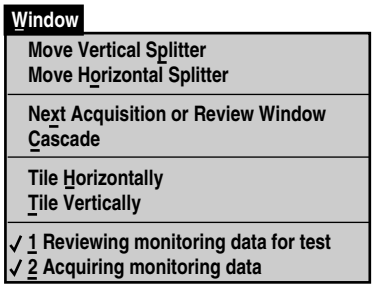

Figure 2: Click on Window and then on Tile Horizontally.

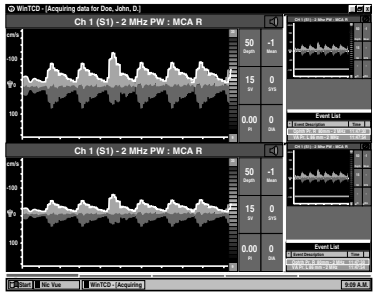

Figure 3: The two Doppler windows are displayed horizontally on the screen display.

Tiling multiple windows vertically

When multiple windows are open (Figure 1) on the screen display, you can choose to tile them vertically so the windows can be viewed simultaneously. This feature is particularly useful for visually comparing two Doppler windows at the same time.

1. Click on the **Window menu** and then click on **Tile Vertically** (Figure 2).

   The currently open windows are tiled vertically on the screen display (Figure 3).

Also see **Maximizing a window** on the next page.

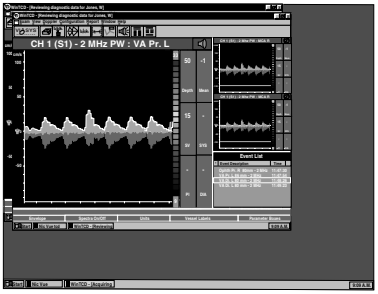

Figure 1: This example shows two Doppler windows cascaded on the screen display.

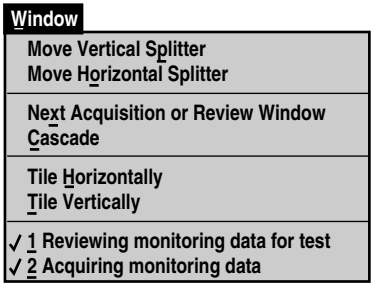

Figure 2: Click on Window and then on Tile Vertically.

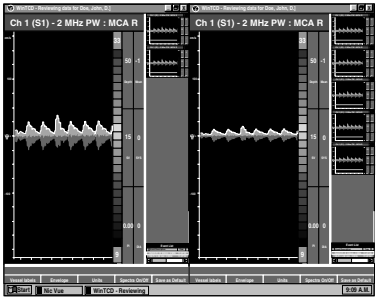

Figure 3: The two Doppler windows are displayed vertically on the screen display.

Maximizing a window

To more clearly view the window, you can maximize it to fill the entire viewing area.

Method 1

1. Click on the **Maximize** button (Figure 1).

Method 2

1. Double-click on the window's **Title bar** (Figure 2).

Also see **Resizing a window** and **Moving a window** in *Chapter S2* of this guide.

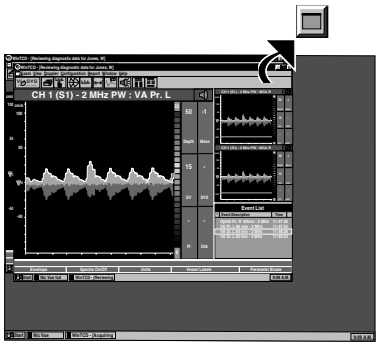

Figure 1: Click on the Maximize button to enlarge the window.

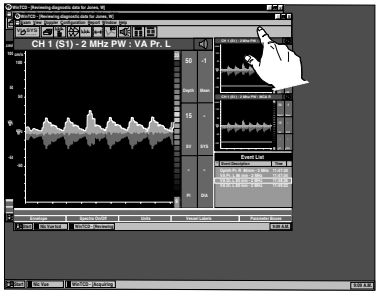

Figure 2: Double-click on the window's Title bar to enlarge the window.

Minimizing a window

To return the maximized window to its original size thus allowing you to choose a different window for viewing:

Method 1

1. Click on the **Minimize** button (Figure 1).

Method 2

1. Double-click on the window's **Title bar** (Figure 2).

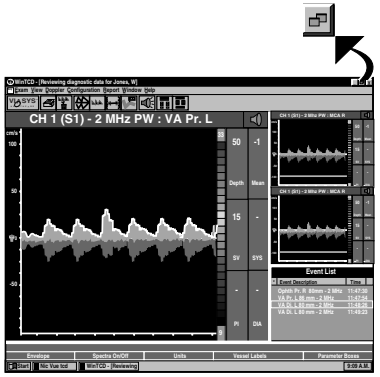

Figure 1: Click on the Minimize button to return the window to its original size.

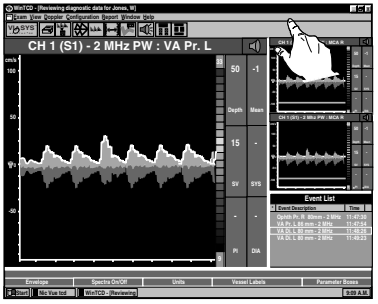

Figure 2: Double-click on the window's Title bar to return the window to its original size.

Chapter S12
Printing, Exporting, and Backing Up Files

Backing up files **S12-1**
Legends S12-1

Printing the spectral window **S12-3**

Printing the trend curves window **S12-4**

Printing the fast curves window **S12-4**

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Automatically Saving PDF Reports **S12-11**

Exporting SoundTrak data to WAV files **S12-12**

Retrieving exported SoundTrak WAV files **S12-13**

Capturing Screens **S12-14**

This chapter describes how to print reports.

If you need help using the keyboard commands (**Alt**+**letter**), see *Chapter S2* in this guide.

Backing up files

To copy (backup) patient files to a storage device (e.g., CD), you must use the NicVue program. See the NicVue Software Guide that shipped with your system for instructions.

To copy (backup) configuration files to a floppy diskette, use the **Copy Config** icon located on the Windows desktop. To later restore these configuration files to the harddisk, use the **Restore Config** icon located on the Windows desktop.

Legends

Diag. Only — Designates Diagnostic Mode only.

Mon. Only — Designates Monitoring Mode only.

Blank Page

Printing the Spectral window

You can use any of the methods on this page to print a copy of the currently active spectral display.

Note: Make sure your printer is connected to the computer, has power applied, and is loaded with paper.

Method 1

1. Press the **Print** key on the Remote Control (Figure 1).

Method 2

1. Click on the **Print** button (Figure 2).

Method 3

1. Click on **Doppler** (Figure 3).
2. Click on **Print Spectral Window**.

Note: If the spectral display window also contains SoundTrak display or M-Mode display data, this data will also be printed out.

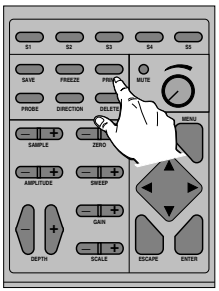


Figure 1: Press the Print key on the Remote Control.

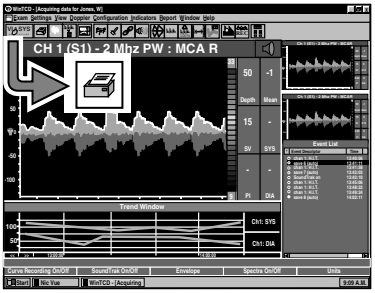


Figure 2: Click on the Print button.

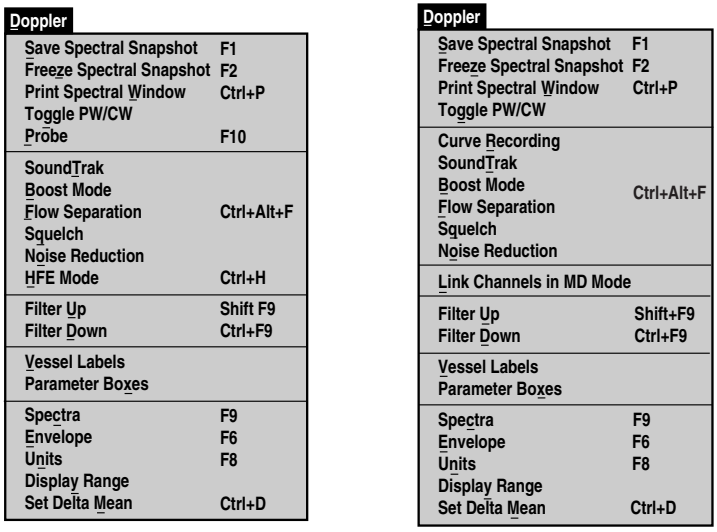


Figure 3: Click on Doppler and then on Print Spectral Window.

Mon. Only Printing the Trend Curves window

You can use this procedure to print a copy of the active Trend Curves window.

Note: Make sure your printer is connected to the computer, has power applied, and is loaded with paper.

1. Using the **Right** mouse button, click in the **Trend window** (Figure 1).

2. Click on **Print Curves** (Figure 3).

Mon. Only Printing the Fast Curves window

You can use this procedure to print a copy of the active Fast Curves window while in the Review mode only.

Note: Make sure your printer is connected to the computer, has power applied, and is loaded with paper.

1. Using the **Right** mouse button, click in the **Fast Curves window** (Figure 2).

2. Click on **Print Curves** (Figure 4).

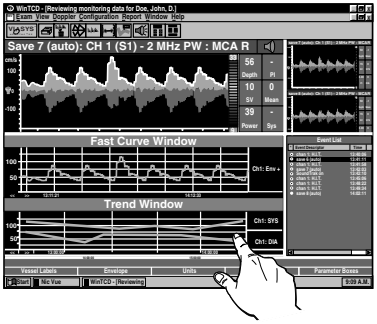


Figure 1: Using the Right mouse button, click on the Trend window.

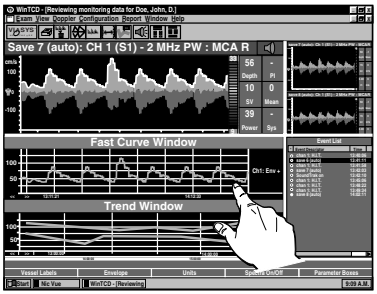


Figure 2: Using the Right mouse button, click on the Fast Curves window.

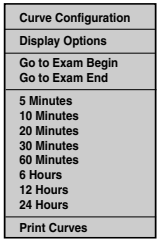


Figure 3: Click on Print Curves.

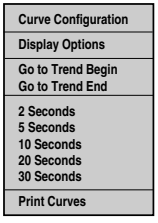


Figure 4: Click on Print Curves.

Diag. Only Printing a text report

Use this procedure in either the acquisition or review modes to print the saved records from the exam.

1. Click on **Report** (Figure 1) and then on **Text Report**.

-or-

1. If one of the softkeys was assigned the **Text Report** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

-or-

1. Click on the **Text Report** button.

2. If you want to add a Footer Comment to your report, click on (checkmark) the **Footer Comment checkbox** (Figure 2), click inside the **Footer Comment text entry box** and then type in your comments.

3. If you want to add a Conclusion to your report, click on (checkmark) the **Conclusion checkbo**x (Figure 2), click inside the **Conclusion text entry box** and then type in your conclusion.

4. Click on **Print**.

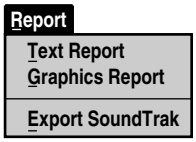


Figure 1: Click on Report and then on Text Report.

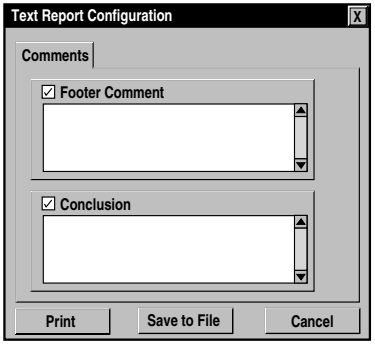


Figure 2: Checkmark the Footer Comment and/or Conclusion checkboxes and type in the desired information. Click on Print when done.

Note: The Mean, Sys, and Dia are calculated in cm/sec. If a vessel label is marked with a "*", the units are kHz. If values have been obtained using manual cursors (recalculated values) the line is marked with an "!".

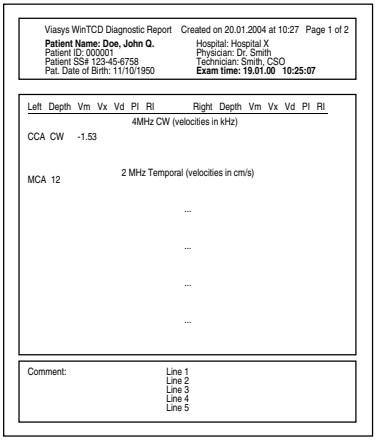


Figure 3: Text report page layout.

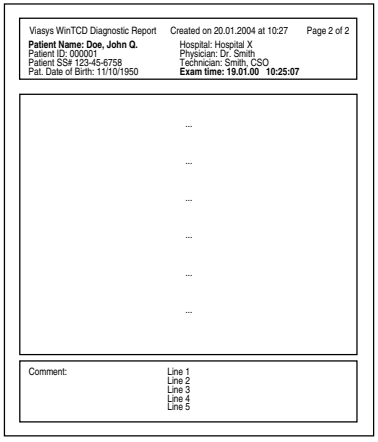


Figure 4: Conclusion report page layout. This page is printed automatically at the end of each report if configured.

Note: The function button **Save to File** can be used as an alternative to the Print button. In this case the report will be saved in PDF format and an additional entry will appear in the NicVue software for the file. Refer to the section Exporting Reports to PDF.

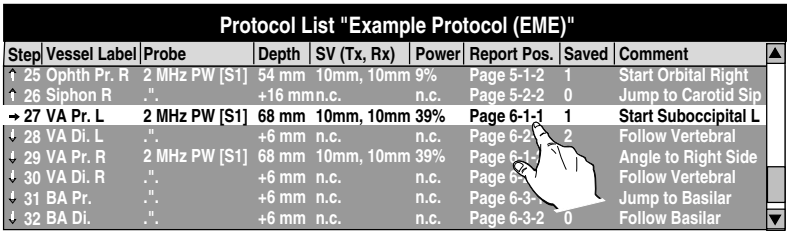
Diag. Only Printing a Graphics report with defined print positions - *Diagnostic mode only*

This type of Graphic report is only for Diagnostic exams which used a protocol with defined print positions.

Note: For exams, which did not use predefined print positions, please go to *page S12-8* in this chapter.

Diag. Only The **Diagnostic Mode** prints the saved spectral records of each step which have a page matrix position (page-row-column) entered on the Report Position column (Figure 1). If, however, some of the steps do not have a page matrix assigned, you can choose to locate those records at the end of the report at the end of this procedure.

Figure 2 shows an example layout for a Graphic report.



Protocol List "Example Protocol (EME)"

Step	Vessel Label	Probe	Depth	SV (Tx, Rx)	Power	Report Pos.	Saved	Comment
↑ 25	Ophth Pr. R	2 MHz PW [S1]	54 mm	10mm, 10mm	9%	Page 5-1-2	1	Start Orbital Right
↑ 26	Siphon R	."	+16 mm	n.c.	n.c.	Page 5-2-2	0	Jump to Carotid Sip
→ 27	VA Pr. L	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-1-1	1	Start Suboccipital L
↓ 28	VA Di. L	."	+6 mm	n.c.	n.c.	Page 6-2-	2	Follow Vertebral
↓ 29	VA Pr. R	2 MHz PW [S1]	68 mm	10mm, 10mm	39%	Page 6-		Angle to Right Side
↓ 30	VA Di. R	."	+6 mm	n.c.	n.c.	Page 6-		Follow Vertebral
↓ 31	BA Pr.	."	+6 mm	n.c.	n.c.	Page 6-3-		Jump to Basilar
↓ 32	BA Di.	."	+6 mm	n.c.	n.c.	Page 6-3-2	0	Follow Basilar

Figure 1: If no page location has been assigned for a protocol step, the Saved Spectral record can still be printed by answering Yes in step 5 on the next page.

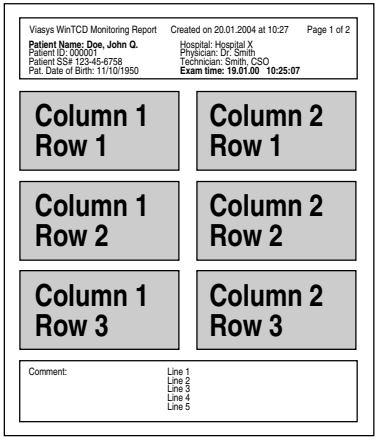


Figure 2: Graphics report page layout.

1. Click on **Report** (Figure 1) and then on **Graphics Report**.

-or-

1. If one of the softkeys was assigned the **Graphics Report** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

-or-

1. Click on the **Graphics Report** button.

2. If you want to add a Footer Comment to your report, click on (checkmark) the **Footer Comment checkbox** (Figure 2), click inside the **Footer Comment text entry box** and then type in your comments.

3. If you want to add a Conclusion to your report, click on (checkmark) the **Conclusion checkbo**x (Figure 3), click inside the **Conclusion text entry box** and then type in your conclusion.

4. Click on **Print**.

5. If the query shown in Figure 3 appears, click on **Yes** to include the saved spectral displays that were not assigned a position on the page(s) at the end of the report. Click on **No** to exclude those saved spectral displays.

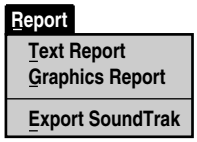


Figure 1: Click on Report and then on Graphics Report.

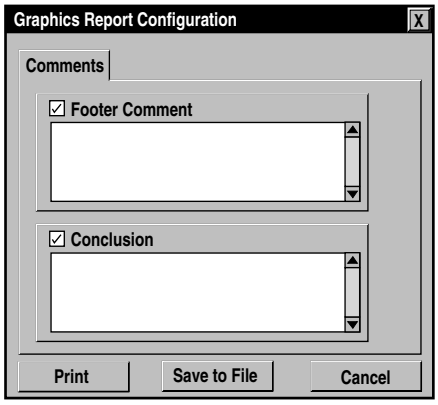


Figure 2: Checkmark the Footer Comment and/or Conclusion checkboxes and type in the desired information. Click on Print when done.

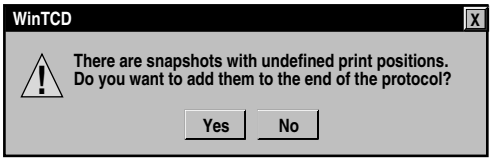


Figure 3: Click on Yes to include the unassigned saved spectral displays to the end of the report or No to exclude them.

Note: The function button **Save to File** can be used as an alternative to the Print button. In this case the report will be saved in PDF format and an additional entry will appear in the NicVue software for the file. Refer to the section Exporting Reports to PDF.

Printing a Graphics report without defined print positions

This type of Graphic report is always used in the monitoring mode but is only for Diagnostic exams which used a protocol without defined print positions.

The advantage of this procedure is that saves can be selected/ deselected for printing, although you have no control over the order of the prints.

1. Click on **Report** (Figure 1) and then on **Graphics Report**.

-or-

1. If one of the softkeys was assigned the **Graphics Report** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

-or-

1. Click on the **Graphics Report** button.

2. On the **Selection** tab (Figure 2), highlight the records you want to include in the report. To select a string of records, click on the first record, hold down the **Shift** key on the keyboard and then click on the last record in the string. The first, last, and all records between will be highlighted.

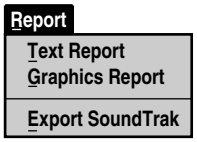


Figure 1: Click on Report and then on Graphics Report.

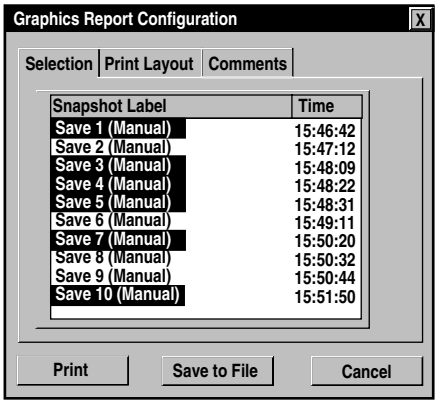


Figure 2: Highlight the records that you want included in the report.

To highlight an assortment of records, hold down the **Ctrl** key and click on the desired records. Only those records you click on will be highlighted.

3. Click on the **Print Layout** tab (Figure 1).

4. Click on the **Layout Matrix** radio button that corresponds with the desired number of **Column** and **Rows** for the report in which you want to place the Saved Spectral displays.

5. Click on the **Color** or **Grayscale** radio button accordingly for the type of printout you want.

6. Click on the **Comments** tab (Figure 2).

7. If you want to add a Footer Comment to your report, click on (checkmark) the **Footer Comment checkbox**, click inside the **Footer Comment text entry box** and then type in your comments.

8. If you want to add a Conclusion to your report, click on (checkmark) the **Conclusion checkbo**x, click inside the **Conclusion text entry box** and then type in your conclusion.

9. If finished, click on **Print**.

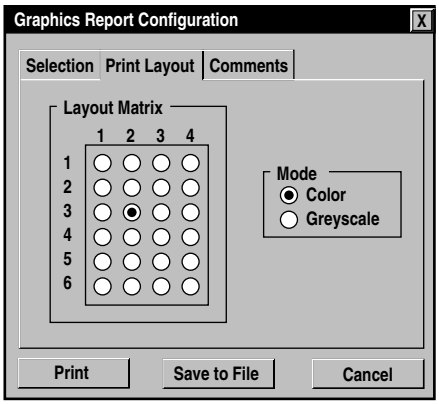


Figure 1: Click on the Print Layout tab, choose the layout matrix for the saved spectral displays and whether you want color or grey scale prints. Click on Print when finished.

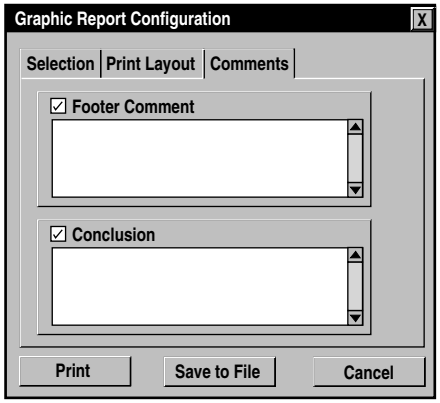


Figure 2: Checkmark the Footer Comment and/or Conclusion checkboxes and type in the desired information. Click on Print when done.

Note: The function button **Save to File** can be used as an alternative to the Print button. In this case the report will be saved in PDF format and an additional entry will appear in the NicVue software for the file. Refer to the section Exporting Reports to PDF.

Exporting Reports to PDF

Both text and graphics reports can be exported to PDF format by using a very similar procedure to the normal report print sequence as explained in the previous sections. Instead of selecting **Print**, from one of the many possible report dialogs, you should choose **Save to File** instead (Example in Figure 1).

When you select the **Save to File** function, the system creates the PDF report file and writes it to disk instead of printing it out.

If a PDF report already exists and you try to save another, the system prompts you to overwrite the file as shown in Figure 2. If you choose **Yes** to overwrite, then the new report replaces the old report. If you choose **No** to not overwrite, then the report function is cancelled.

Both the text reports and the graphics reports each get their own entry in NicVue. These appear to you as if additional examinations have been made.

The date and time of the *report* examinations are the same as the original examination.

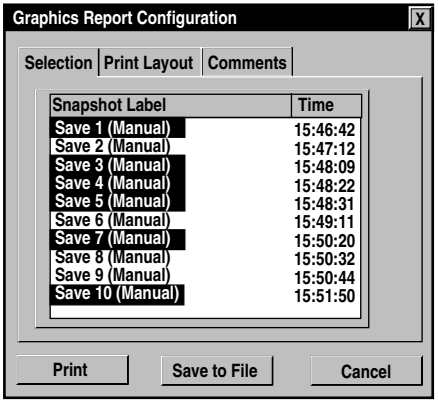


Figure 1: Click on Save to File to get PDF Report.

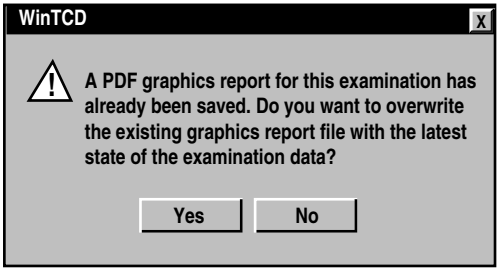

WinTCD
X
A PDF graphics report for this examination has already been saved. Do you want to overwrite the existing graphics report file with the latest state of the examination data?
Yes
No

Figure 2: Prompt to Overwrite PDF Report.

The abbreviations for the *report* examinations are DT for the diagnostic text report, DG for the diagnostic graphics report, and MG for the monitoring graphics report.

Inside of the NicVue software, the five types of WinTCD exams (D,M, DT, DG, and MG) can all be processsed individually. This gives you the ability to archive both the original examination data and the report data separately.

Since the PDF text reports and PDF graphics reports each get their own entry in NicVue, the files have a different GUID identifier and are saved in a different location in the data directory. In this way, you can delete the original examination data and keep the PDF reports for the patient. By right clicking on the report file entry in NicVue and selecting Exam Information, the path and data file name can be obtained.

Automatically Saving PDF Reports

Some users prefer to have the generation of the PDF reports done automatically. The advantage of this approach is to ensure that PDF report files are made for all examinations and that the information is always up to date.

The automatic generation of PDF text and graphics reports can be configured individually. Use the following steps to activate the automatic generation of PDF reports:

1. Click on **Configuration** and then on **System** (Figure 1).

2. Click on **Auto PDF Text Report** or **Auto PDF Graphics Report** (Figure 1).

When the Auto PDF Text Report menu point is chosen, then it receives a check mark next to it to show that it is selected and that the automatic saving feature is active. By choosing the menu point again, the function can be toggled off and the check mark can be removed. The same applies to the Auto PDF Graphics Report menu point.

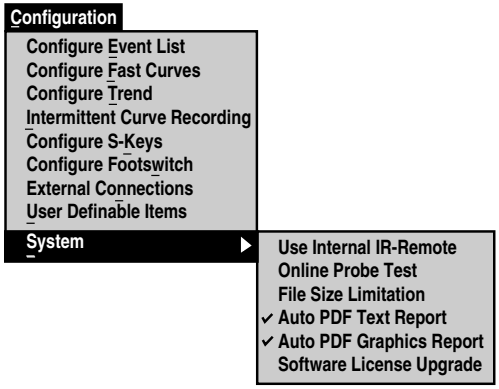


Figure 1: Click on Configuration, then on System, and then select one of the Auto PDF report functions.

The automatic saving feature functions in two ways:

1. When you select the Print function out of a report dialog, the text or graphics report is printed out in the normal way. In addition, if the corresponding Auto PDF Report configuration function is selected, the system creates the PDF file and writes it to disk as well.

2. Upon exiting the WinTCD program, when a check mark is present, the system automatically saves the report type to a PDF file. This ensures that a PDF report is always saved and the report is always up to date with the latest saves and post-processing information for those customers who want this automatic feature. Upon exiting the WinTCD program, when one or both Auto PDF report functions are checked, the system evaluates whether any post-processing has been done. If the system determines that the saved report is no longer up to date, then the system prompts you to overwrite the file. This can mean that you could be prompted two times (once for the text report and once for the graphics report).

Note: If the automatic PDF report saving functions are activated, the amount of time needed to shut down the program, when exiting the acquire and review modes, will be increased.

Exporting SoundTrak data to WAV files

If spectral records have been saved containing SoundTrak data, then this data can be exported to WAV files for use with other applications.

In order to export the SoundTrak data to WAV files:

1. Click on **Report** (Figure 1) and then on **Export SoundTrak**.

-or-

1. If one of the softkeys was assigned the **Export SoundTrak** function, either click on the displayed softkey or press the corresponding S-key on the Remote Control.

2. In the **dialog box** (Figure 2), highlight the records you want to export to WAV files. To select a string of records, click on the first record, hold down the **Shift** key on the keyboard and then click on the last record in the string. The first, last, and all records between will be highlighted. To highlight an assortment of records, hold down the **Ctrl** key and click on the desired records. Only those records you click on will be highlighted.

3. If finished, click on the **Export** button.

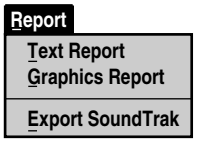


Figure 1: Click on Report and then on Export SoundTrak.

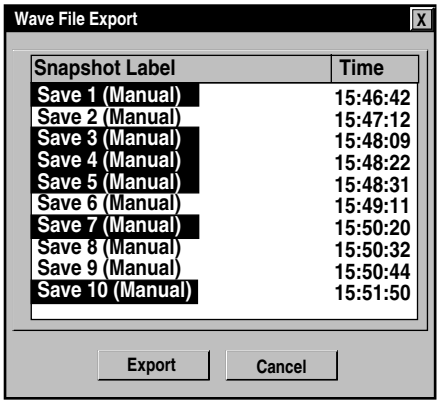


Figure 2: Highlight the records that you want to export to WAV files.

Note: The WAV files are written to a sub directory of the exam data on the harddrive. The data path is defined using the DCM with the NicVue program. The directory path by default is D:\Nicolet\WinTCD\Data. Each exam gets its own directory in the Data directory using a GUID number. This number and the data path can be determined by using the Exam Info function in the Help menu. In the Exam GUID directory, an export directory will be created containing the WAV file records and a header file. The header file is a text file and contains the patient information. Each WAV file gets a file name consisting of the vessel label, depth, probe frequency, channel, and time of save to uniquely identify each record.

Retrieving Exported SoundTrak WAV files

The exported SoundTrak WAV files may be copied/moved in order to add to PowerPoint or other media presentations.

In order to retrieve the exported SoundTrak WAV files for further use:

1. Minimize **WinTCD**.
2. In **NicVue**, the study you exported from should be highlighted. Above the study will be an icon that contains a **blue letter i in a white balloon**. Click this icon.
3. A new window will appear, towards the bottom of this window will be a field called **Data File**. This is where your **SoundTrak** file is contained. In most cases, it will be **D:\Nicolet\wintcd\data\…** The letters following **data** correspond to the folder where the **SoundTrak** data is contained. **Note this folder name**.
4. Click **OK** to close this window.
5. Minimize **NicVue**.
6. Double-click on **My Computer**.
7. Double-click on the **Data (D:)** icon.
8. Double-click on **Nicolet**.
9. Double-click on **WinTCD**.
10. Double-click on **Data**.
11. Locate your desired data folder and double-click on it.
12. Double-click on **Export**.

Capturing Screens

Screen dumps can be made from the WinTCD software for use in PowerPoint or other media presentations.

In order to capture a screen display for further use:

1. Activate the WinTCD program in either the acquire or review mode.

2. From the Event List, **double-click** on the saved image you wish to "capture" or just set up the display with the data you want to "capture".

3. Hold down the **Shift** key, and simultaneously press the **Print Screen** (Prt Sc/Sys Rq key in upper right part of your keyboard) key.

4. Minimize **NicVue** and **WinTCD**.

5. Click on **Start**.

6. Click on **Programs**.

7. Click on **Accessories**.

8. Click on **Imaging**.

9. In the upper left hand corner of the screen, click on the **white icon** beneath **File** to open a new document.

10. Click on **JPG File**.

11. Click **OK**.

12. At the top of the screen, click **Edit**.

13. Click on **Paste**.

14. A message appears saying the image in the clipboard is larger than the image. Click **Yes** to resize the image.

15. Click on **File**.

16. Click **Save As…**

17. Enter a **File name**.

18. Click **Save**.

This process will save these files as .jpg in the My Documents folder.

Chapter S13
Help Menu

About WinTCD **S13-3**

Exam Information **S13-4**

This chapter describes the Help menu function.

- **About WinTCD**
- **Exam Info**

If you need help using the keyboard commands (**Alt**+**letter**), see *Chapter S2* in this guide.

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About WinTCD

The About WinTCD panel lists the various software versions used with WinTCD.

1. Click on **Help** (Figure 1).
2. Click on **About WinTCD**.
3. When finished, click on **OK** (Figure 2).

-or-

1. Click on the **About WinTCD** button.
2. When finished, click on **OK** (Figure 2 - Examples are shown for both systems).

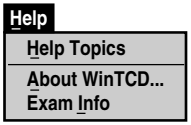

Figure 1: Click on Help and then on About WinTCD.

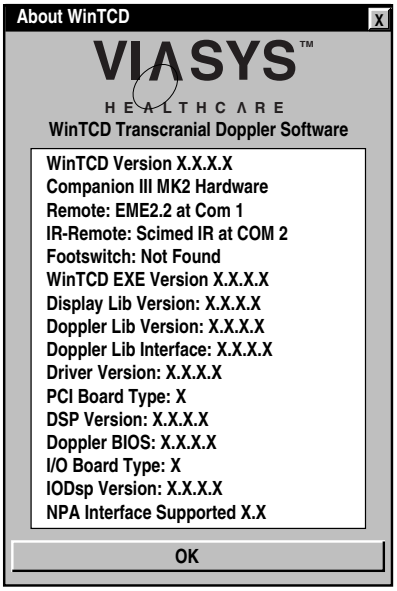

Figure 2: When finished, click on OK.

Exam Information

Any items grayed out on the Exam Info menu are not available.

1. Click on **Help** (Figure 1).
2. Click on **Exam Info**.
3. When finished, click on **OK** (Figure 2).

Note: When creating Continuous SoundTrak files, the information contained in the Exam Info menu is very important for estimating the amount of free recording space. Whenever parameters are changed, like the number of channels or the PRF (scale setting), the data rates change so users should always take a quick look in the Exam Info menu to make sure there will be enough recording space to finish the examination.

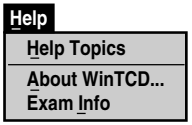

Figure 1: Click on Help and then on Exam Info.

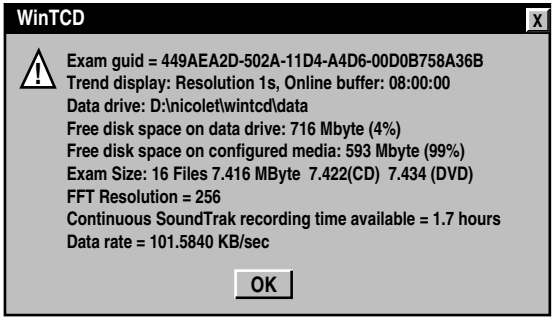
WinTCD
X
Exam guid = 449AEA2D-502A-11D4-A4D6-00D0B758A36B
Trend display: Resolution 1s, Online buffer: 08:00:00
Data drive: D:\nicolet\wintcd\data
Free disk space on data drive: 716 Mbyte (4%)
Free disk space on configured media: 593 Mbyte (99%)
Exam Size: 16 Files 7.416 MByte 7.422(CD) 7.434 (DVD)
FFT Resolution = 256
Continuous SoundTrak recording time available = 1.7 hours
Data rate = 101.5840 KB/sec
OK

Figure 2: When finished, click on OK.

Chapter S14
System Menu

Software License Upgrade Menu **S14-3**

Using the Infrared Remote Control **S14-4**

Online Probe Test **S14-4**

File Size Limitation Menu **S14-5**

This chapter describes the System menu function.

- **Software License Upgrade**
- **Use Internal IR-Remote**
- **Online Probe Test**
- **File Size Limitation**

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Software License Upgrade Menu

In order for the WinTCD software to run, the system needs to have a valid software license installed. Depending on the system and the options ordered, a unique software license is generated and installed on the system during the manufacturing process. Each time the program is loaded, the system reads the license code and activates the features which have been installed. If new features are purchased at a future date, these can be installed by using the procedure below.

1. Click on **Configuration** and move to **System** (Figure 1).

2. Click on **Software License Upgrade**.

3. Enter the new license code (obtained from your EME representative) in the appropriate field (Figure 2) and select **Load** (Figure 2).

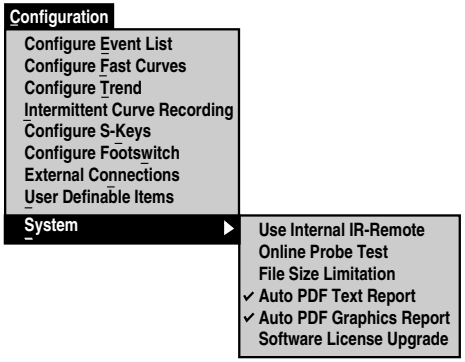

Figure 1: Click on Configuration, System, and then on Software License Upgrade.

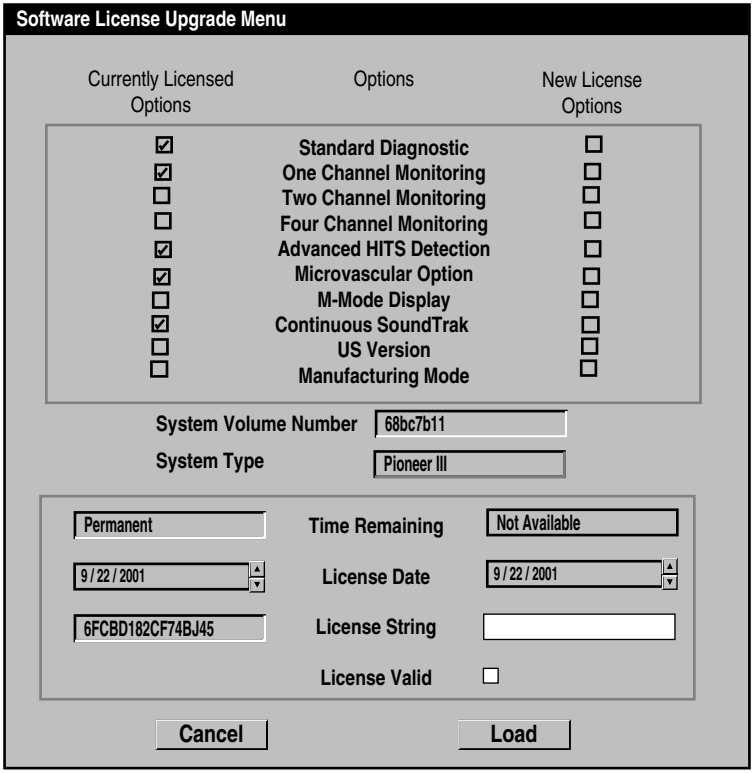

Figure 2: Enter the new license code, and when finished, click on Load (Pioneer III system example).

Use the Infrared Remote Control

There are two types of remote control options for the system. The standard version is a hardwired remote. The second version is an infrared model. If the infrared remote control is used, it needs to be activated by using the procedure below.

1. Click on **Configuration** and move to **System** (Figure 1).
2. Click on **Use Internal IR-Remote**. A checkmark should appear indicating that the infrared remote has been activated.

Online Probe Test

There is an extra function built into the system to consistently check if the transducers are still plugged in. If the probes are removed during operation, the system will automatically notify the user. This function can be activated by using the procedure below. It is recommended to keep this function switched off.

1. Click on **Configuration** and move to **System** (Figure 1).
2. Click on **Online Probe Test**. A checkmark should appear indicating that the probe check has been activated.

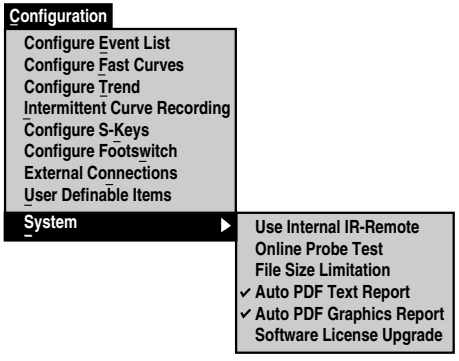

Figure 1: Click on Configuration, System, and then on Use Internal IR-Remote or Online Probe Test.

File Size Limitation Menu

In many cases, especially when the continuous SoundTrak feature is used, the WinTCD examination file sizes can get quite large. Depending on the type of backup media used for archiving purposes, users may want to limit their file sizes so they will fit onto the backup media. In order to configure the maximum file size, the following procedure should be used.

1. Click on **Configuration** and move to **System** (Figure 1).

2. Click on **File Size Limitation** and the configuration dialog will appear (Figure 2).

3. Click the mouse on one of the three radio buttons (Figure 2) and select **OK** (Figure 2).

Note: There are three choices for the maximum file size. The first choice will limit the examination size to fit on a CD media. The second choice will limit the examination size to fit on a DVD media. The last choice will not limit the examination size at all so all the empty space on the harddisk can be used for the examination.

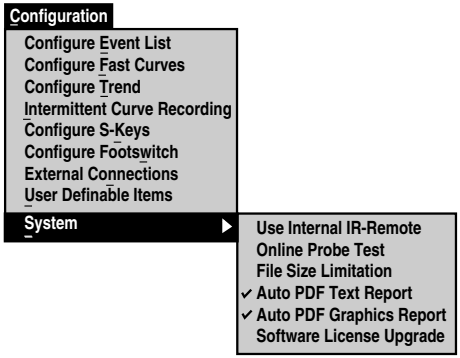

Figure 1: Click on Configuration, System, and then on File Size Limitation.

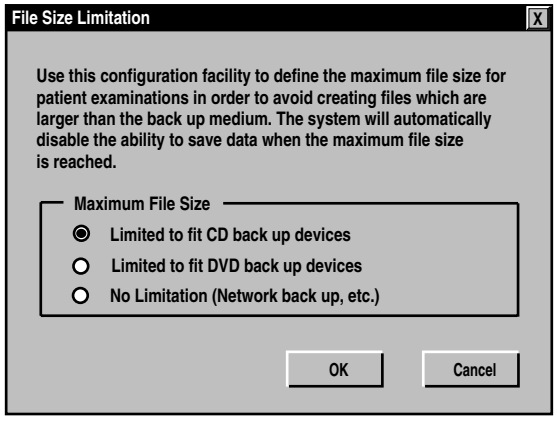
File Size Limitation
Use this configuration facility to define the maximum file size for patient examinations in order to avoid creating files which are larger than the back up medium. The system will automatically disable the ability to save data when the maximum file size is reached.
Maximum File Size
Limited to fit CD back up devices
Limited to fit DVD back up devices
No Limitation (Network back up, etc.)
OK
Cancel

Figure 2: Click on one of the three radio buttons, and when finished, click on OK.

Note: Refer to section S17 in this manual for more information on Keeping Track of File Size during monitoring examinations.

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Chapter S15
Microvascular Option

16 MHz and 20 MHz probe operation notes **S15-3**

This chapter describes the 16 MHz PW and 20 MHz PW Microvascular options which have been designed to allow intraoperative investigations of microvessels. The microvascular probes can be sterilized (see “Sterilizing 16 MHz and 20 MHz Probes” in Chapter H5) and, therefore, may be used invasively during surgical or endoscopic procedures.

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16 MHz and 20 MHz probe operation notes

1. The use of the microvascular option is associated with an increased safety standard due to the invasive nature of the application. Proper sterilization and electrical safety precautions should be followed as stated in Chapter H1 of this manual. Please refer to this information on proper safety precautions when using the microvascular probes.

2. Refer to Chapter H3 or H4 of this manual for information on properly connecting the microvascular probes and preamps to the system.

3. The 16 and 20 MHz transducers should be treated with extra care as they are delicate and expensive to replace.

4. All standard features of the system software apply - including the Printing and Monitoring mode of operation.

5. It is important to note that the 16 and 20 MHz probes are Pulsed Wave Doppler probes. Be aware of the **Depth** and **Image** gate settings at all times for optimum and accurate results.

6. If you are unfamiliar with microvascular Doppler and the benefits of the Pulsed Wave Doppler Modality, Nicolet recommends the text Intraoperative Doppler Sonography in Neurosurgery by Joachim M. Gilsbach. Published by Springer-Verlag, Wien, New York.
ISBN 3-213-81768-9 and
ISBN 0-387-81768-9.

7. Although the 16 and 20 MHz probes are small, flexible and durable to allow use with common surgical tools, care should be taken not to pinch or severely bend the probe cable, damage can result. Some users have found it convenient to thread the transducer into a suction device (e.g., #9 Fujita Sucker), adhering the tip with bone wax.

Note: The microvascular transducers are only supported in the software when there is a valid Microvascular license installed in the system. New systems sold with the microvascular probes and preamps will contain the license. If a system is later upgraded with the microvascular probes and preamps, a new license will be needed. In the case where the probes are tried without a license, an error message will appear and not allow the probes to be activated. Contact Nicolet or your local Nicolet distributor for a new license containing the microvascular option.

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Chapter S16
Using the Color M-Mode Display

Loading color M-Mode settings **S16-3**

Creating a new color M-Mode settings file **S16-4**

Spectral display window layout **S16-5**

Color M-Mode display window **S16-6**

Color M-Mode image **S16-7**

Highlighting the appropriate window **S16-8**

Selecting spectral multi-depth channels **S16-8**

Set the M-Mode depth scale range **S16-9**

Set the M-Mode depth scale offset (zero) **S16-9**

Adjust the sample volume depth **S16-10**

Adjust the sample volume length **S16-10**

Adjusting the M-Mode channel bands **S16-11**

Adjust the M-Mode display gain **S16-12**

Adjust the M-Mode color display range **S16-12**

Inverting the color M-Mode velocity scale **S16-12**

Toggling the M-Mode flow direction coding **S16-13**

Selecting the M-Mode color display palette **S16-14**

Toggling the M-Mode display enhancement **S16-15**

Continued on the next page.

This chapter describes how to use the color M-Mode display in conjunction with the multi-depth monitoring mode. Refer to *Chapters S5 and S7* for descriptions on the normal monitoring mode functions.

Note: The M-Mode display is not available on the Companion III LE model.

Legends

Mon. Only — Designates Monitoring Mode only.

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Freezing the spectral/M-Mode display	**S16-16**
Saving the spectral/M-Mode display	**S16-17**
Post processing the color M-Mode display	**S16-18**

Mon. Only Loading color M-Mode settings

Note: The procedures on this page are for the Monitoring Mode only, not the Diagnostic Mode.

When switching into the monitoring acquire mode, the system automatically loads a default setting. If the default Settings file is not the file you wish to use during the examination, perform either of the following procedures to select a different Settings file.

To Create a New Settings file, create a New Default Settings file, Delete a Settings file, or Rename a Settings file, see the next page and/or *Chapter S9* in this guide.

Note: Color M-Mode displays are only available with 1x8 and 2x4 settings if a valid M-Mode display software license is installed in the system. See *Chapter S14* in this guide.

Note: Factory default settings, containing an M-Mode display, always include the word M-Mode in the setting name.

Method 1

1. Click on the **Settings Manager** button.

2. Click on the **file** (usually has M-Mode as part of the name) you want to use and then click on **Load** (Figure 1).

Note: The current Settings file is identified with an **Arrow** prefix. The **Diamond** prefix is the current default.

Method 2

1. Click on the **Settings** menu (Figure 2).

2. Select the **Settings Manager** menu point.

3. Click on the **file** (usually has M-Mode as part of the name) you want to use and then click on **Load** (Figure 1).

Note: Figure 3 will not appear if the transducers are connected correctly to the system. If incorrect connections were made, make the corrections as necessary and then click on **Load**.

You can choose to override the system and click on the **Manual assignment** checkbox and then make your selections from this panel. The number of channels must however remain the same.

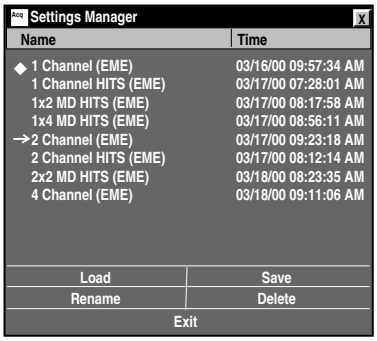

Figure 1: Click on the Settings file you want to load and then click on Load.

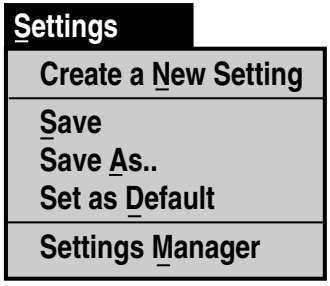

Figure 2: Click on the Settings menu and then on the Settings Manager menu point.

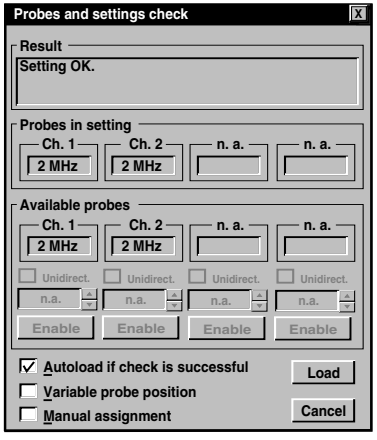

Figure 3: This panel does not appear if the probes are connected correctly to the system (Pioneer TC8080 example).

Creating a new color M-Mode Settings file

A Settings file contains various (default) settings which, when selected, automatically sets the previously defined system parameters. This helps reduce the amount of setup time.

Note: Transducers must be attached to the system in order to create settings.

Assign the probe(s) and channel(s)

Use this procedure to assign connected probes to the intended channel(s).

1. Click on **Settings** (Figure 1).
2. Click on **Create a New Setting**.
3. Select 8 depths for one probe or four depths for two probes (Figure 2) accordingly by clicking the small up/down arrows.
4. Choose the FFT resolution (Figure 2) by clicking on one of the three radio buttons. The FFT resolution defines the number of vertical points (bins) in the spectral display. The higher the FFT resolution, the finer the frequency resolution of each bin will be. In multi-channel applications, a lower FFT resolution will allow faster spectral sweep speeds.
5. Ensure that the M-Mode display is enabled by checking the box (Figure 2).
6. Click on **Load** (Figure 2).

Note: A channel selection can be deselected by clicking on the Disable button.

Note: Refer to Chapter S17 in this guide for additional information on creating special settings to record or playback audio data from a DAT tape or to use the Continuous SoundTrak option, which records all the audio data in digital format.

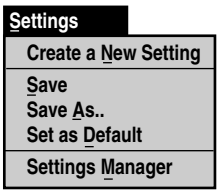

Figure 1: Click on Settings and then on Create a New Setting.

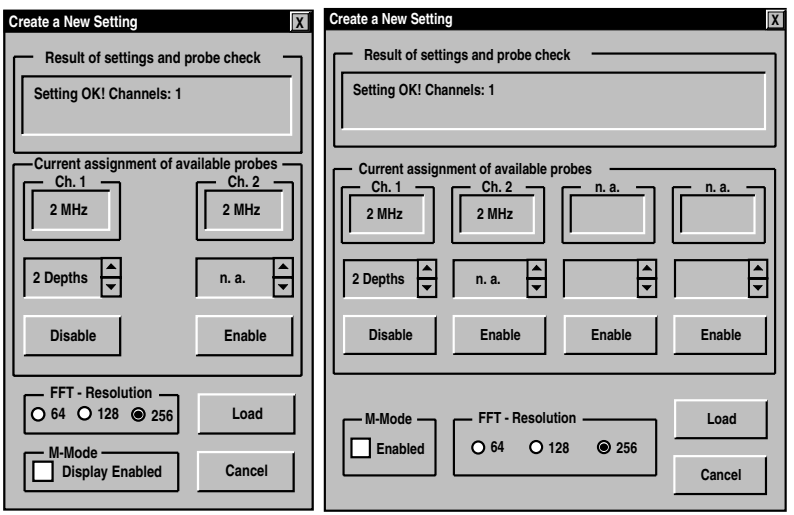

Figure 2: Assign the connected probes to the desired channels or select the number of depths each and then click on Load (Companion III and Pioneer TC8080 examples shown).

Spectral display window layout

Depending on whether a unilateral or bilateral M-Mode setting was loaded the area of the screen, where the spectral windows are usually displayed, will now appear as shown in either Figure 1 or Figure 2.

The size and position of the normal spectral display windows have been changed. All eight spectral channels are now displayed in a column as small "control" spectral windows to the left of the window. The active (focussed) spectral display is displayed as a large window above the M-Mode display. The active channel has the title bar highlighted (in both the large display and the control display) to indicate that it is the active channel.

The M-Mode display window(s) is not a stand-alone window and therefore its size cannot be adjusted independently from the spectral windows.

The small spectral control windows only have depth and mean parameter boxes and cannot be configured.

Only the parameter boxes in the large spectral display(s) can be configured and these are saved in the settings file.

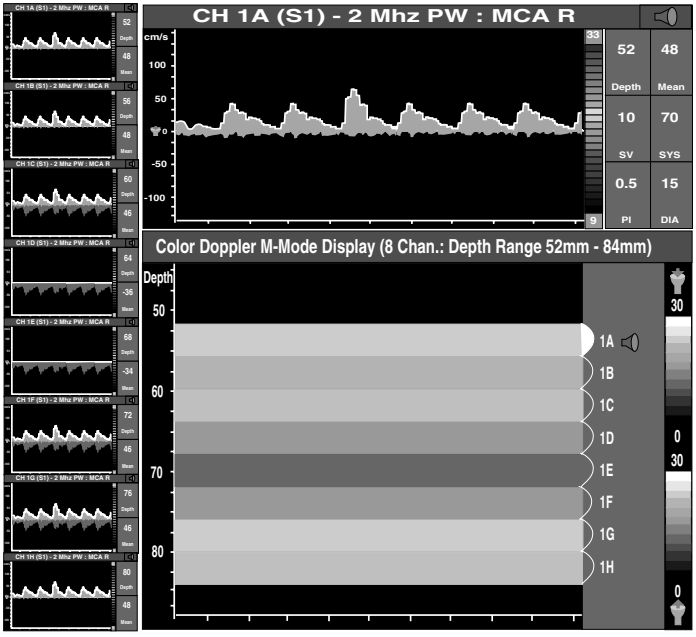

Figure 1: Unilateral Setting with Color M-Mode display.

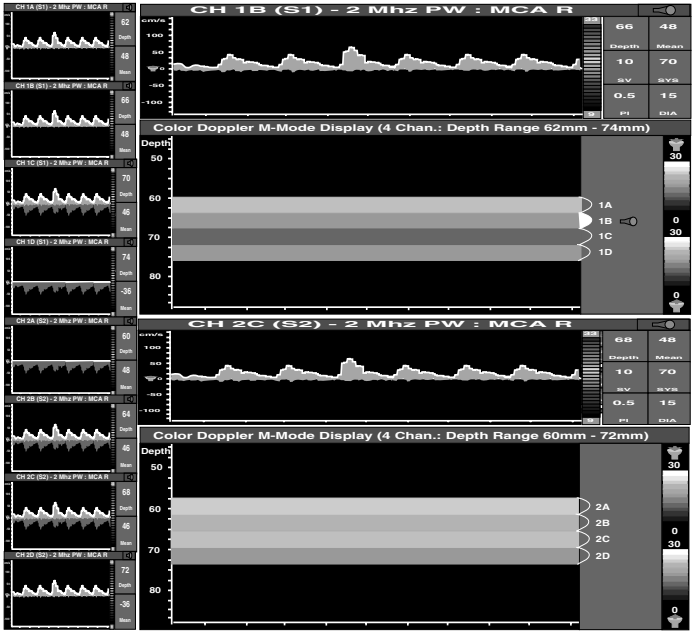

Figure 2: Bilateral Setting with Color M-Mode display.

Color M-Mode display window

The scale on the left side of the display is a depth scale to show the ranges of the different M-Mode channel bands. The bands are defined with their associated depth setting in the middle of the band. e.g. If the first spectral display has a depth of 50mm with a sample volume length of 10mm, the first band starts at 45mm and ends at 55mm.

The M-Mode data is color coded and displayed to the right of the depth scale using a dB scale. See section *Color M-Mode Image*.

To the right of the M-Mode data, the channel bands are labeled so the user can tell which band of M-Mode data comes from which Doppler channel. Next to the channel labels, small arches are drawn in white to indicate where the channel bands start and stop. These arches show the user the overlap or separation between channels. Next to the active channel label, the arch is filled in to indicate the channel which is focussed for keystrokes.

To the right of the channel bands labels, a column is drawn to show which channel is being heard in the speakers. This column has a speaker symbol next to the channel where the audio signal is coming from.

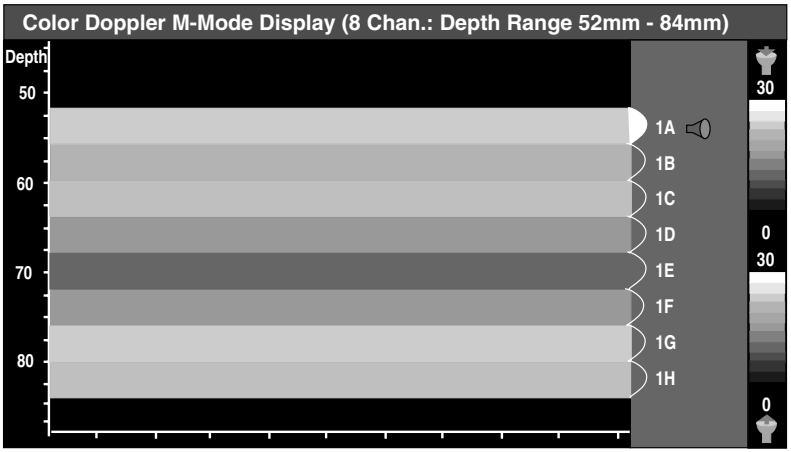

Figure 1: Color M-Mode display window.

To the far right of the display, the special M-Mode color scale is displayed. The top half of the color scale is for flow toward the probe data and is shown in different shades of red/orange/yellow. The flow toward the probe icon is located above these colors. The bottom half of the color scale is for flow away from the probe data and is shown in different shades of blue/green. The flow away from the probe icon is located below these colors.

In the case that the M-Mode display is configured for only one flow direction, only one color scale is used. See section *Toggling the M-Mode Flow Direction Coding*.

In the case that the M-Mode display is configured for the total power mode, only one color scale is used and the flow icon is not drawn.

There are three different palettes for the color scales. The first one (Palette 1) is a mixed color scale as described previously. The second one (Palette 2) is a pure red (toward), pure blue (away), and pure green (total) scale. The third one (Palette 3) is similar to the second one but have white mixed in with the strongest color to help distinguish H.I.T.S. data. See section *Selecting the M-Mode Display Color Palette* for information on how to toggle the color scales.

The background of the M-Mode display is a dark gray. This distinguishes areas of no insonation from areas of weak signal (black).

Color M-Mode image

The Color M-Mode Image is generated by making intensity calculations on the spectral data in the eight different spectral channels. These spectral displays are often referred to as M-Mode channel bands and are labeled corresponding to the spectral display windows.

For each spectral channel, three average power values (Flow towards the probe, flow away from the probe, and total power) are calculated for each column of data. These calculations assume the zero line is in the middle of the display.

Depending on the display mode (See section *Toggling the M-Mode Flow Direction Coding)*, one of the three calculated values is color coded according to the intensity scale and displayed for each of the eight channel bands. In the case that both flow toward and away from the probe are configured, the stronger signal is selected for display.

To take into account the overlapping between channel bands and the tailing off of the signal strength at the edges of the sample volume, some additional image processing is needed to optimize the M-Mode image.

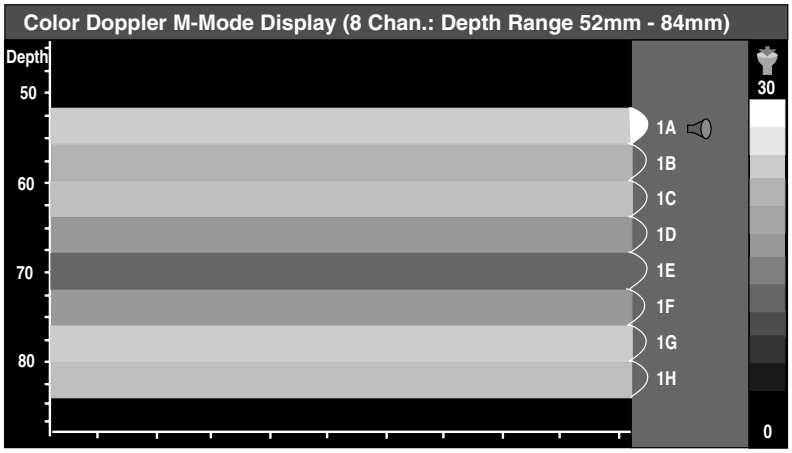

Figure 1: Unidirectional Color M-Mode display window.

The eight possible channel bands in the M-Mode display are expanded out to include additional bands between the true bands. These additional bands (extra depth settings) are based on data which is interpolated from the two adjacent bands.

Three different types of depth interpolation are provided to the user to choose from. These are a no interpolation option, a Display Enhancement A option, and a Display Enhancement B option. See section *Toggling the M-Mode Display Enhancement.*

Highlighting the appropriate window

In the non M-Mode monitoring settings, the Probe key on the remote control can be used to select the spectral channel which will receive the keystrokes for adjustments like Depth or Zero Line. This functionality has been slightly changed to account for the new style of spectral display window introduced along with the M-Mode display.

When a special M-Mode setting is active, the Probe key now only toggles between the large spectral windows (associated with probe sockets) and the M-Mode display. In the unilateral case, the Probe key toggles the focus between the one large spectral display window and the M-Mode window and visa versa. In the bilateral case, the Probe key rotates the focus from the first large spectral display window, to the first M-Mode window, and then to the second large spectral display window, and finally to the second M-Mode window.

As always all appropriate keystrokes go to the focussed window.

At any time it is also possible to toggle the window focus by clicking the mouse on the appropriate window.

The title bar on the selected small spectral display control window lights up as being highlighted when its associated large spectral window is highlighted.

The audio sound heard in the speakers comes from the focussed large spectral window. If the M-Mode window has the focus, then the audio sound heard in the speakers comes from the associated large spectral window. A small speaker is drawn next to the M-Mode channel band where the sound is coming from. By clicking on this speaker, it is possible to mute the sound.

Note: The functionality of the window key on the remote control is independent of the methods described on this page. This key is used to move the main Windows focus circling through the Event List, Trend window, Spectral/M-Mode window, and the Copy window. In order for the methods described on this page to work, the main Windows focus needs to be on the Spectral/M-Mode window.

Selecting spectral multi-depth channels

When one of the large spectral windows is focussed, it is possible to rotate through the associated multidepth channels (small spectral control windows) by using the up/down arrow keys. Each time an arrow key is pressed, the large spectral display window is filled with the contents of the next or previous multidepth channel. At this point, the Doppler parameters for this channel can be altered. The title bar highlighting the small multidepth channel control window moves accordingly.

At any time it is also possible to select the multidepth channels by clicking the mouse on the desired small spectral control window. This works in a similar way to using the arrow keys. If the small spectral control window is from the other socket then the focus on the large spectral window is also changed. This is also the case if an M-Mode window is highlighted.

At any time it is also possible to select the multidepth channels by clicking the mouse on the appropriate band label in the M-Mode display.

Set the M-Mode depth scale range

Multiple depth scale settings are available for the M-Mode display. You can change the scale to adjust the vertical height of the M-Mode channel bands.

When the M-Mode display is highlighted (focussed), use the **Scale** key (Figure 1) to adjust the displayed depth scale range. You may also use **Ctrl + F2** to decrease or **Shift + F2** to increase the scale setting.

Increasing the scale setting increases the range of depths shown in the display. Decreasing the scale setting decreases the range of depths shown in the display.

The depth range scale for the M-Mode display is adjustable in steps of 1 mm. The minimum scale range is 10 mm. The maximum scale range is 100 mm.

Set the M-Mode depth scale offset (zero)

The starting depth (upper display limit) in the M-Mode display is adjustable. You can change the offset to shift the M-Mode data up and down in the display.

When the M-Mode display is highlighted (focussed), use the **Zero** key (Figure 2) to adjust the displayed depth scale offset. You may also use **Ctrl + F3** to decrease or **Shift + F3** to increase the scale offset.

Increasing the zero setting moves the M-Mode data up in the display. Decreasing the zero setting moves the M-Mode data down in the display.

The depth scale offset for the M-Mode display is adjustable in steps of 1 mm. The upper display minimum depth value in the scale is 10 mm. The lower display maximum depth value in the scale is 160 mm.

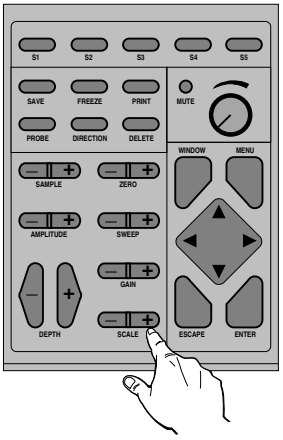

Figure 1: Scale key.
{Ctrl F2 = -}, {Shift F2 = +}

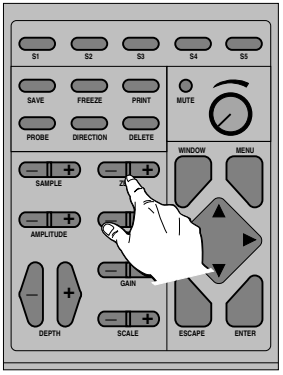

Figure 2: Zero key.
{Ctrl F3 = -}, {Shift F3 = +}

Adjust the sample volume depth

Since all the spectral channels are linked (MD Link On) when the M-Mode display is present, the depth settings of all channels can be changed simultaneously.

Use the **Depth** key (Figure 1) to move the sample volume of all channels either deeper or shallower. You may also use **Ctrl + F1** to decrease or **Shift + F1** to increase the depth.

Altering the depth setting shifts the M-Mode channel bands either up or down in the display.

The range of depth settings is limited by the pulse repetition frequency (PRF) setting so automatic scale reductions may occur.

Adjust the sample volume length

Since all the spectral channels are linked (MD Link On) when the M-Mode display is present, the sample volume length of all channels can be changed simultaneously.

Use the **Sample** key to adjust the length of the sample volume of all channels (Figure 2). You may also use **Ctrl + F6** to decrease or **Shift + F6** to increase the sample volume.

The Sample volume is the axial length of the area from which Doppler signals are obtained. The sample size can range from 1 to 15 mm and its length is displayed in the Parameter box labeled **SV**. It is important to remember that the size of the sample volume influences the ultrasonic power output. The larger the sample volume, the longer the duration of the pulse burst, and consequently the higher the ultrasound output and power.

Note: Always apply the ALARA principle; use power levels that are: As Low As Reasonably Achievable.

By adjusting these values, the resolution of the channels bands can be changed. If the total depth range of all channels is low and the sample volume size is large then the sample volumes will overlap quite a bit creating a very low resolution image. In this case it would be better to use a smaller sample volume size to see better definition between bands.

When adjustments will cause empty spaces between bands (i.e. when SV is less than the depth separation), the background gray is displayed between the bands.

The overlap between channel bands is limited to 50%.

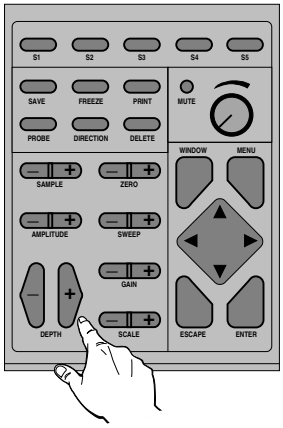

Figure 1: Depth keys. {Ctrl F1 = -}. {Shift F1 = +}

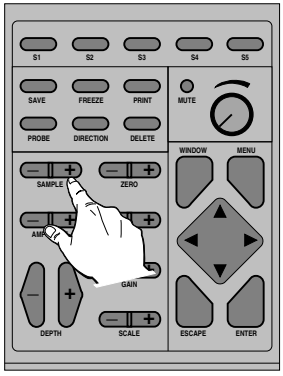

Figure 2: Sample key. {Ctrl F6 = -}, {Shift F6 = +}

Note: The sample volume setting is displayed in parenthesis for multi-depth receiver channels.

Note: See Configuring the Sample Volume Functionality in *Chapter S7* in this guide.

Adjusting the M-Mode channel bands

In addition to the previously described functions, it is possible to adjust the separation between the M-Mode channel bands by using the S-key functions **MD Expand Depths** or **MD Contract Depths**.

These adjustments are the equivalent of adjusting the depths on all channels so the difference in depths between channels gets larger or smaller. See Figures 1 and 2. Expanding the depths increases the depth separation between spectral channel bands in 2 mm increments. Contracting the depths decreases the depth separation between spectral channel bands in 2 mm increments.

When adjustments will cause empty spaces between bands (i.e. when SV is less than the depth separation), the background gray is displayed between the bands.

The overlap between channel bands is limited to 50%.

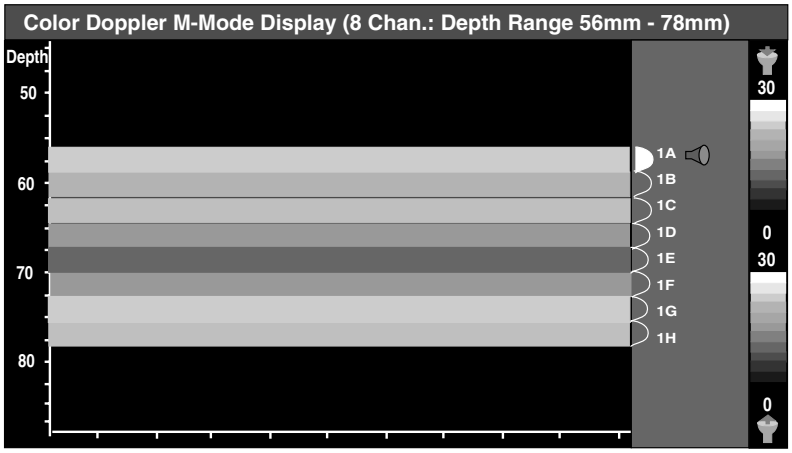

Figure 1: Color M-Mode display window before Expand Depths.

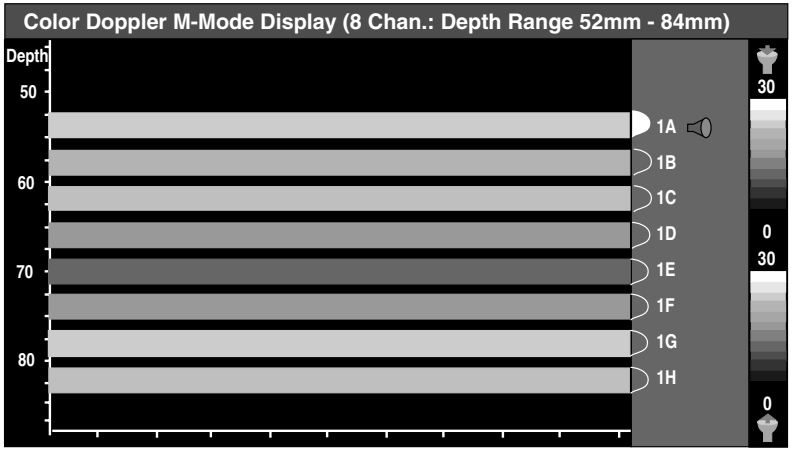

Figure 2: Color M-Mode display window after Expand Depths.

Adjust the M-Mode display gain

When the M-Mode display is highlighted (focussed), it is possible to adjust the software gain for the M-Mode display.

Use the **Gain** key (Figure 1) to adjust the software gain either higher or lower. You may also use **Ctrl + F4** to decrease or **Shift + F4** to increase the gain.

Increasing the software gain strengthens the signal (readjust the colors up) in the M-Mode display. Decreasing the software gain weakens the signal (readjust the colors down) in the M-Mode display. The dB numbers in the scales are adjusted accordingly.

The upper and lower limits for the dB values are approximately the same as the spectral displays. When adjustments are made to the M-Mode dB scale, this does not affect the spectral displays.

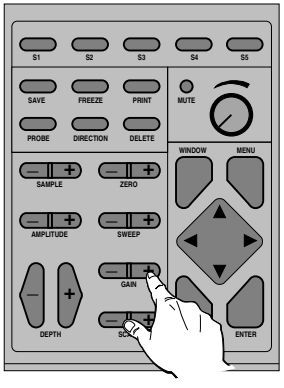

Figure 1: Gain key. {Ctrl F4 = -}, {Shift F4 = +}

Adjust the M-Mode color display range

When the M-Mode display is highlighted (focussed), it is possible to adjust the color display range (software gain range) for the M-Mode display by using the **Display Range** s-key.

There are six hard coded ranges available to toggle through similar to the Display Range function for the spectral displays.

The upper and lower limits (dB values) for the color scale are altered each time the display range is toggled. Depending on the signal strength and noise level of the Doppler spectral channels, the different ranges will provide different results for the display quality.

In addition, you may also use **Ctrl + F11** to decrease or **Shift + F11** to increase the display range in 1 dB steps.

Inverting the color M-Mode velocity scale

When the M-Mode display is highlighted (focussed), it is possible to select the way the M-Mode displays the depth scale. By using the **Direction** key on the remote control or the **F4** key on the keyboard, it is possible to invert the M-Mode display so the display is low to high or high to low.

Toggling the M-Mode flow direction coding

In the case that only flow in one direction is of interest, users have the ability to configure the system to ignore the data coming from the other fIow direction or if the flow direction is irrelevant then a total power mode is also available.

When the M-Mode display is highlighted (focussed), it is possible to select the way the M-Mode display codes the flow direction. By using the **Display Options** S-Key on the remote control or the **F6** key on the keyboard, it is possible to toggle through the available options (Flow Towards or Away, Flow Towards Only, Flow Away Only, Unidirectional Total Power).

The algorithm for the M-Mode display uses only the data from the selected sides of the spectral display windows for its calculations.

The color scales in the M-Mode display are toggled accordingly. See Figures 1 and 2.

The envelope curves and flow direction configured on the spectral displays are completely independent of the M-Mode flow direction coding.

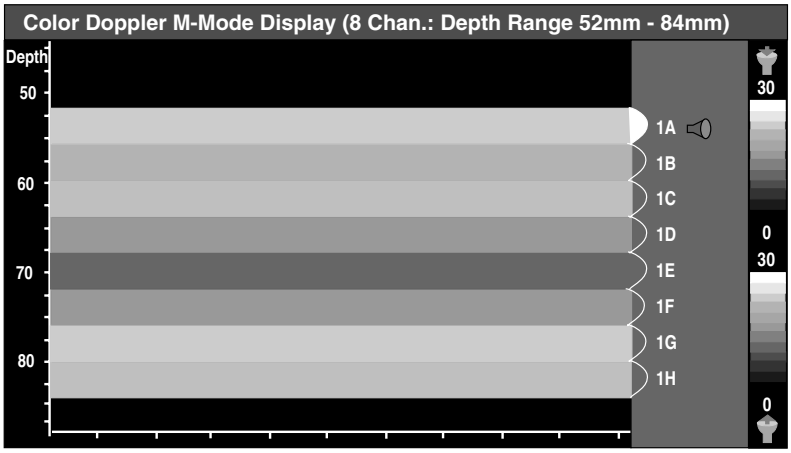

Figure 1: Color M-Mode display window with flow toward and away.

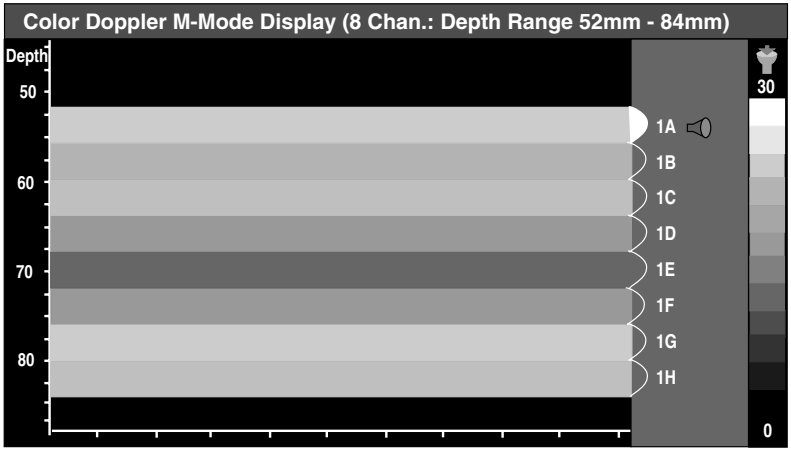

Figure 2: Color M-Mode display window with power flow toward only.

Selecting the M-Mode color display palette

There are three different palettes for the M-Mode color scales. The first one (Palette 1) is a mixed color scale. The second one (Palette 2) is a pure red (toward), pure blue (away), and pure green (total) scale. The third one (Palette 3) is similar to the second one but has white mixed in with the strongest color to help distinguish H.I.T.S. data.

The Color M-Mode palette is configurable by using one of the following two methods:

Method 1

1. Click on **View** and then on **Color M-Mode Palette** (Figure 1) and select the palette from the list.

Method 2

1. Right click on the M-Mode display to get the **Color M-Mode Menu** (Figure 2) and select the palette from the list.

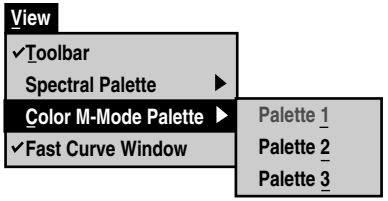

Figure 1: Click on View and then on Color M-Mode Palette and then select the palette from the list.

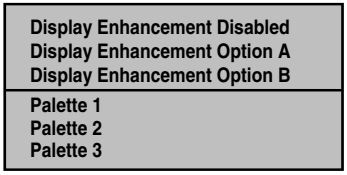

Figure 2: Right click on the M-Mode display and then select the palette from the list.

Toggling the M-Mode display enhancement

To take into account the overlapping between channel bands and the tailing off of the signal strength at the edges of the sample volume, some additional image processing is needed to optimize the M-Mode image.

The eight possible channel bands in the M-Mode display are expanded out to include additional bands between the true bands. These additional bands (extra depth settings) are based on data which is interpolated from the two adjacent bands.

Three different types of depth interpolation are provided to the user to choose from. These are a no interpolation option, a Display Enhancement A option, and a Display Enhancement B option.

The different types of depth interpolation are configurable by using the following method:

Method 1

1. Right click on the M-Mode display to get the **Color M-Mode Menu** (Figure 1) and select the display enhancement from the list.

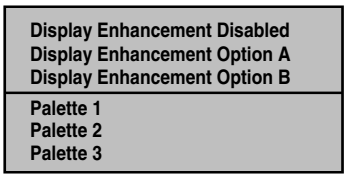

Figure 1: Right click on the M-Mode display and then select one of the three display enhancements from the list.

Freezing the spectral/ M-Mode display

You can freeze the current Spectral/M-Mode display at any time for closer inspection, postprocess with Gain, Zero, etc., and then, if you wish, save a Snapshot of the frozen display for later inspection. In the pop up freeze window, both the spectral displays and M-Mode display are present and remain synchronized in time.

Method 1

1. Press the **Freeze** key on the Remote Control (Figure 1).

Method 2

1. Press the **F2** key on the keyboard (Figure 2).

Method 3

1. Click on **Doppler** and then on **Freeze Spectral Snapshot**.

Method 4

1. Click on the **Freeze Spectral Snapshot** button.

The window focusing inside the pop up freeze window is similar to the normal spectral/M-Mode display window where the Probe key, arrow keys, mouse etc. can be used to highlight different display windows inside of the pop up freeze window. The focussed window gets the keystrokes when the pop up freeze window is active.

The following post-processing functions are available in the pop up freeze window for the frozen M-Mode display: Software Gain, M-Mode Depth Range Scale, M-Mode Depth Scale Offset, M-Mode Velocity Scale Direction, M-Mode Color Display Range, M-Mode Display Palette, and M-Mode Display Enhancement. These should function in a similar way to the real time M-Mode display.

All the data for the M-Mode display is available in the Freeze mode, so it is also possible to toggle the display of the data using the flow direction toggling as described previously.

The post-processing functions for the frozen spectral displays remain as in previous software releases.

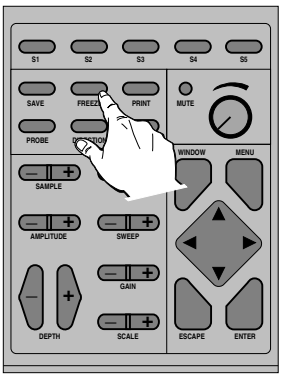

Figure 1: Press the Freeze key.

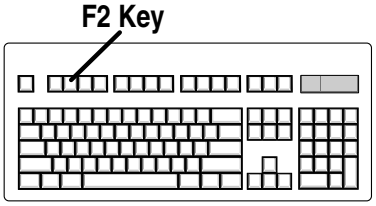

Figure 2: Press the F2 key to freeze the spectral/M-Mode display.

Saving the spectral/ M-Mode display

There are five different methods to save spectral/M-Mode display records - just like the normal spectral record saves:

Method 1

1. When you see a display you want to save for review, press the **Save** key (Figure 1) on the remote control.

Method 2

1. Press **F1** on the keyboard.

Method 3

1. Click on the **Save Snapshot** button.

Method 4

1. Click on **Doppler** and then on **Save Spectral Snapshot**.

Method 5

1. Enable the **Indicator** algorithm to automatically save the spectra each time a H.I.T.S. occurs.

See *Enabling the Indicator* in chapter S7.

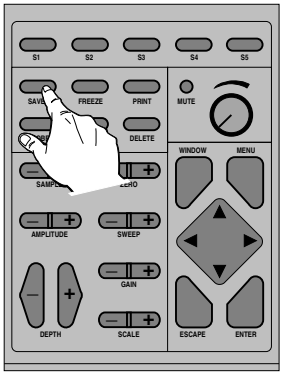

Figure 1: Press the Save key on the remote control or press F1 on the keyboard to manually save the current Spectral/M-Mode screen to the hard disk.

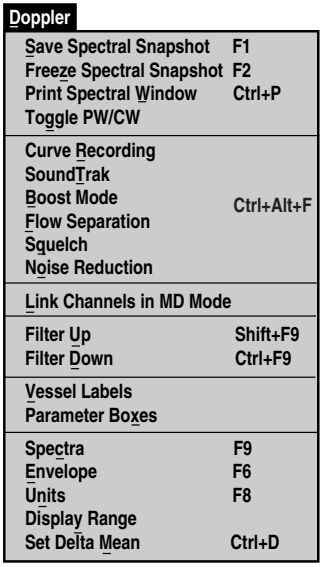

Figure 2: Click on Doppler and then Save Spectral Snapshot.

Post processing the color M-Mode display

The following post-processing functions are available in the post processing mode for the M-Mode display: Software Gain, M-Mode Depth Range Scale, M-Mode Depth Scale Offset, M-Mode Velocity Scale Direction, M-Mode Color Display Range, M-Mode Flow Direction Coding, M-Mode Display Palette, and M-Mode Display Enhancement.

These function in a similar way to the real time M-Mode display as previously explained in this chapter.

Chapter S17
Using the External Inputs and Outputs

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This chapter describes the external input and output facilities which allow curve and audio data connections to external units. The Doppler audio signals can be recorded to an external DAT recorder and played back in at a later time. The envelope curves from the spectral displays are available as analog curve output signals. Finally there are analog curve inputs provided to allow external analog signals (like a CO2 curve) to be read in.
For convenience the connection of the external devices is made via the optional Analog Connection Box which contains eight RCA input connectors and eight RCA output connectors. Refer to Chapter H3 or H4 for a description of the proper connection procedure for the analog connection box.

In addition, the raw digital audio data (Continuous SoundTrak) can be saved to the harddisk. Upon reading in patient files, this data is then available for reviewing and postprocessing.

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Description of Audio Inputs and Outputs

The Pioneer TC8080 and Companion III systems support the ability to record and playback the audio Doppler data using an external recording device.

Up to four spectral channels (eight quadrature channels) can be recorded or played back simultaneously. If analog curve inputs or outputs are also used, then the total number of available channels is reduced. Two channels of audio information for each Doppler FFT display are required. These audio channels are quadrature, meaning they have a 90 degree phase relation to each other. Proper quadrature separation is necessary for the accurate reproduction (separation of flow toward and away from the transducer) of a Doppler FFT from stored audio signals, therefore a DAT (Digital Audio Tape) is recommended.

The connection of the external DAT recorder should be made via the optional Analog Connection Box (Figure 1) which contains eight RCA (standard audio) input connectors and eight RCA output connectors.

Once connected, the signals need to be properly configured via the External Connections configuration menu (see *Creating Audio I/O Settings)* later in this chapter.

Once signals have been configured, they are savable to the settings files or the protocol files. In this way numerous combinations of signals are possible by just loading a new setting or protocol and the configuration is only done once.

The special setting and protocol files are clearly color coded as either recording (red) or playback (green) and by choosing one of these, users can quickly set up the system for the desired functionality.

Note: The audio input and output facility requires that the optional analog input/output circuit board is installed in the system. If this board is not installed, the external connections configuration menu point will not be functional. Please consult your local Nicolet distributor for information on upgrading your system hardware.

Figure 1: Analog Connection Box.

! WARNING

On both systems, when a DAT recorder is used to record or playback Doppler audio data, it must be powered through the main system's isolated power sockets (Pioneer only), or via the portable Isobox isolation Transformer (both systems).

The DAT recorder must meet the standard relevant to your country: IEC 60065:2001, BS EN 60065:2002, UL 60065:2003, CAN/CSA-C.22.2 No 60065-03, IEC 60950-1:2002, BSEN 60950:2002, UL 60950-1:2002, CAN/CSA-C.22.2 No 60950-1-03.

On the Pioneer TC8080 sytem, the total power consumption from both mains outlets should not exceed 150VA.

When using an Isobox isolation Transformer, ensure that the voltage selector on the Isobox is set to the correct voltage before connection.

If an Isobox isolation transformer is not available for connecting a mains powered accessory, the system may NOT be used.

Creating Audio I/O Settings

Before the audio inputs and outputs can be used, special record and playback settings need to be created. There are no sample factory default settings since most likely users will want to convert their own customized settings into either record or playback settings.

Use the following steps to create either record or playback settings:

1. In the acquire mode, load the protocol or settings file which you want to use or create a new settings or protocol file and set the system up the way you want it.

2. Select the **External Connections** menu point out of the Configuration menu (Figure 1).

3. Click on the analog outputs tab to configure the audio output channels for a record setting (Figure 2) or click on the analog inputs tab to configure the audio input channels for a playback setting (Figure 3). Refer to the explanation on the next page.

Note: The external connections dialog box is only available in the acquire mode and only before any data has been saved.

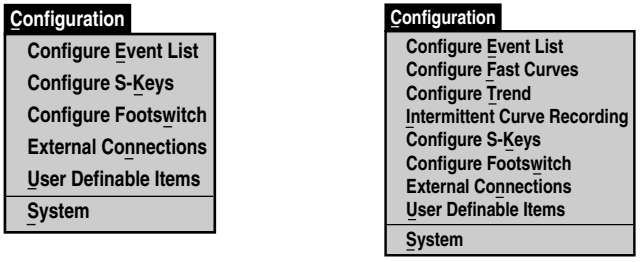

Figure 1: Click on the Configuration menu and then on the External Connections menu point (diagnostic and monitoring examples).

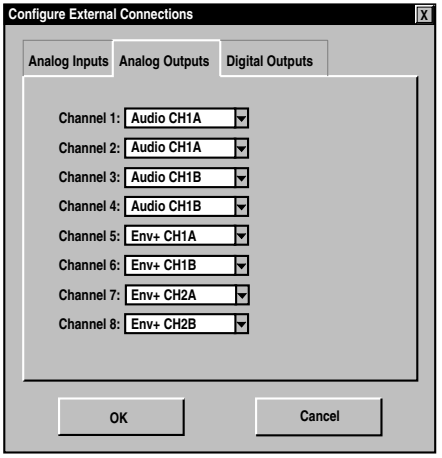

Figure 2: External Connections dialog box (analog output tab).

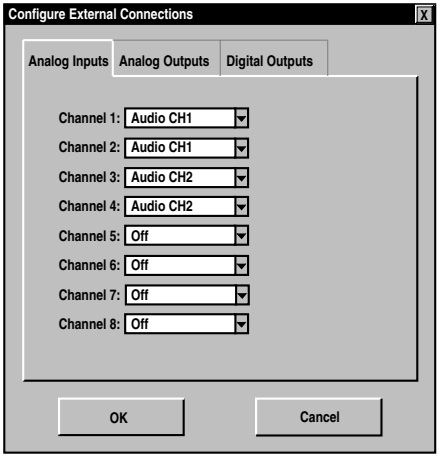

Figure 3: External Connections dialog box (analog input tab).

Creating Audio I/O Settings (continued)

4. There are eight available inputs and eight available outputs which correspond with the RCA connectors on the analog connection box. Activate the desired signal(s) for the inputs or outputs by clicking the mouse on the combo box selection arrow (to the right of the white boxes) for the appropriate numbered connector and choosing the signal from the list of available signals (Figures 1 and 2).

5. When all signals have been configured as desired, click on **OK** to activate the external connections.

6. Once the required external connections have been assigned and loaded, the settings should be saved by saving the active setting or protocol file with the **Save** or **Save As** functions in either the Settings or Protocol menus.

Note: When an audio signal is assigned to a particular connector, automatically the same setting is assigned to the neighboring connector so there is always a pair of audio signals representing the phase and quadrature signals. The audio signal pairs are always assigned with either connectors 1-2, 3-4, 5-6, or 7-8. In other words if a user assigns Audio Ch2A to connector 6 then connector 5 is also assigned Audio Ch2A and visa versa. This method ensures that users can not swap the order of the audio signals causing the flow direction to invert when playing the signals back in.

Note: Both audio inputs and outputs cannot be activated at the same time.

Note: Both record and playback settings files can be created for the monitoring mode but only record settings can be created for the diagnostic mode. The reason for this is that the playback mode does not make much sense in the diagnostic mode since the place of insonation is not known during playback mode. The diagnostic record mode is supported so users, who use a VCR to record complete examinations on video tape, can also easily record the audio sound on the tape.

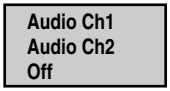

Figure 1: Available audio signals (Bilateral Monitoring).

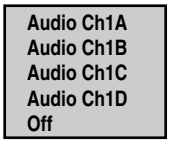

Figure 2: Available audio signals (1x4 MD Monitoring).

Note: The choices available for each combo box list are dependent on the present system setting (number of channels, etc.). Figure 1 shows an example list for a standard bilateral setting. Figure 2 shows an example list for a 1x4 MD channel setting.

Loading Settings and Protocols with External Connections

User defined settings and protocol files, which use external connections, can be loaded in the exact same way as normal settings and protocol files which was explained in Chapter S7 of this manual.

The only difference with the settings and protocol files, containing external connections, is that these are color coded in the list of available configuration files (Figures 1 and 2). The record file names are written in red text and the playback file names are written in green text. The normal configuration files are written in white text. The record file entries also get a red recording symbol next to the name and the playback file entries get a green play symbol next to the name.

Note: Since the system is already operating with a certain configuration, when the new external settings are loaded, the system may need to switch modes (record / playback) to activate the assigned channels. The presence of probes is checked when switching from a playback setting to a non playback setting. No check is necessary if the system switches to playback mode since the system does not require probes in the playback mode.

Note: The probe settings are contained in the configuration file even if the file is a playback setting since this information is used to properly set up the system for correct probe frequencies etc. In addition to the frequency of operation for each channel, the hardware gain of the input amplifiers and the PRF scale set is also saved. See Using the Playback Mode later in this chapter.

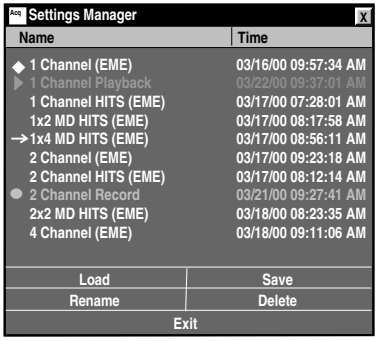

Figure 1: Settings Manager with color coded record and playback files.

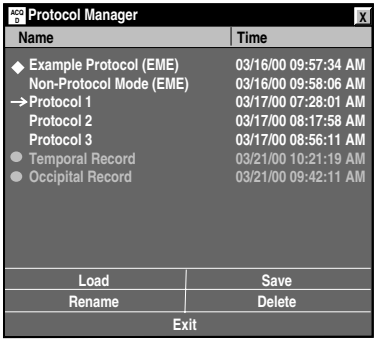

Figure 2: Protocol Manager with color coded record files.

Using the Record Mode

When a record configuration file is loaded, the program sets up the system to route the appropriate audio signals to the configured output channels on the analog connection box. This is indicated to the user through the use of a small indication symbol (red dot next to speaker) added to the spectral displays which are being recorded (Figure 1).

Note: Since it is not a requirement to always record all Doppler channels, some spectral displays may not have the record symbol.

In the record mode, all Doppler functions maintain the same functionality. The user can perform a standard acquisition examination and all the Doppler activity for the configured channels are stored to the external recording device which has been attached to the output connectors on the analog connection box.

Note: The voltage outputs are fixed to an optimized level and are not user adjustable.

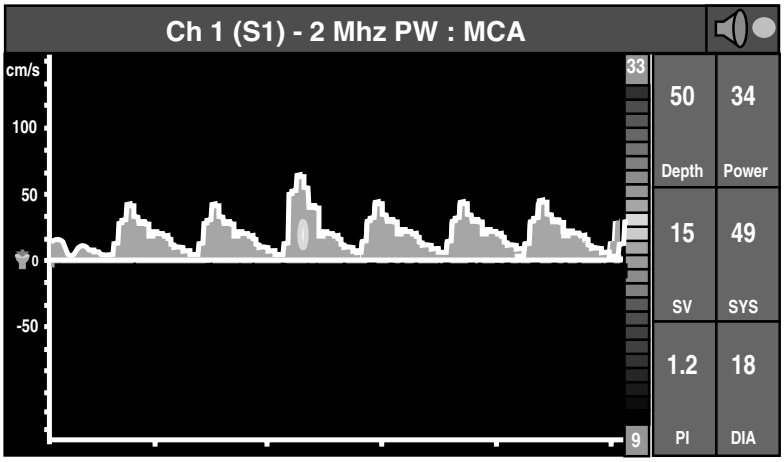

Figure 1: Spectral Display with Record Mode Indicator (Red Dot).

Using the Playback Mode

When a playback configuration file is loaded, the program turns off the internal Doppler and sets up the system to read in the appropriate audio signals from the configured input channels on the analog connection box. This is indicated to the user through the use of a small indication symbol (green arrow next to speaker) added to each of the spectral displays (Figure 1). In addition the title bars of the spectral displays are altered to indicate audio playback and the depth, power, amplitude, sample volume, filter, and TIC/TIS indicators will show "-".

In the playback mode, the system functionality differs in many ways compared to the standard acquisition mode. All Doppler functions, which are no longer available, have been switched off. The display functions (zero, sweep, etc.) still function as usual. The other functions which have been altered are described in the following sections.

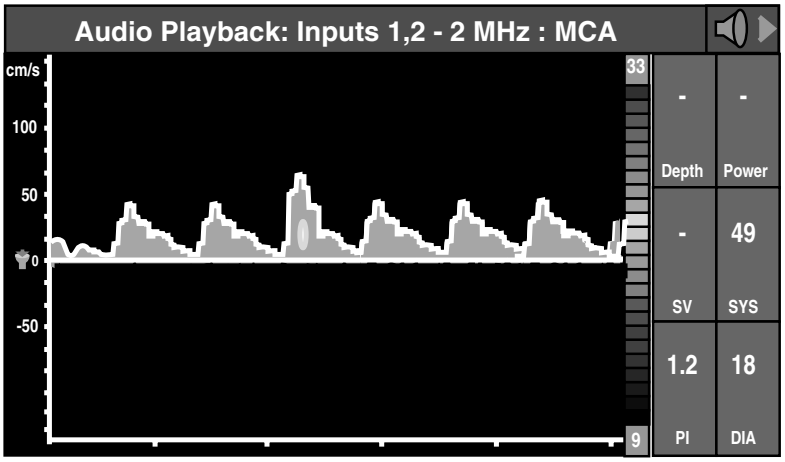

Figure 1: Spectral Display with Playback Mode Indicator (Green Arrow).

Adjusting the Scale

The scale key on the remote control also adjusts the scale setting during the playback mode but instead of adjusting the pulse repetition frequency of the Doppler, the scale key adjusts the rate at which the data is read in.

The same scale setting, which was used in the record mode, should be used in the playback mode. This setting can be found by adjusting the scale during the playback mode and watching the spectral display until everything looks normal. When incorrect scale settings are used, there will be multiple images of the Doppler spectral data or aliasing problems.

If audio data from an old EME system (TC2020, TC4040, Companion I, or Companion II) is being played back, then the PRF scale set will need to be changed using the s-key (**Audio Playback Scale Set**) since the scales are not exactly the same in the TC8080 and Companion III systems compared to the older systems.

Adjusting the Audio Gain

The gain key on the remote control also adjusts the gain setting during the playback mode but instead of adjusting the amplification of the Doppler, the gain key adjusts the amplification of the audio data being read in. The input amplification can be adjusted from 0 up to 20 in steps of 1.

Description of Analog Curve Inputs and Outputs

The Pioneer TC8080 and Companion III systems support the ability to read in and display analog curve signals coming from an external device as well as providing the ability to obtain the spectral envelope curves as analog outputs.

Up to eight analog channels can be read in, displayed, and saved simultaneously. Up to eight analog channels are also provided as outputs for envelope curves. If audio inputs or outputs are also used, then the total number of available channels is reduced.

The connection of the external devices should be made via the optional Analog Connection Box (Figure 1) which contains eight RCA (standard audio) input connectors and eight RCA output connectors.

Once connected, the signals need to be properly configured via the External Connections configuration menu (see *Creating Curve I/O Settings)* later in this chapter.

Once signals have been configured, they are savable to the settings files or the protocol files. In this way numerous combinations of signals are possible by just loading a new setting or protocol and the configuration is only done once.

Note: The analog curve input / output facility requires that the optional analog input/output circuit board is installed in the system. If this board is not installed, the external connections configuration menu point will not be functional. Please consult your local Nicolet distributor for information on upgrading your system hardware.

Figure 1: Analog Connection Box.

! WARNING

On both the Pioneer TC8080 and the Companion III systems, when an analog curve connection is made to an external device, the external device must be powered through the main system's isolated power sockets (Pioneer only), or via the portable Isobox isolation Transformer (both systems).

The external device must meet the standard relevant to your country: IEC 60065:2001, BS EN 60065:2002, UL 60065:2003, CAN/CSA-C.22.2 No 60065-03, IEC 60950-1:2002, BSEN 60950:2002, UL 60950-1:2002, CAN/CSA-C.22.2 No 60950-1-03.

On the Pioneer TC8080 sytem, the total power consumption from both mains outlets should not exceed 150VA.

When using an Isobox isolation Transformer, ensure that the voltage selector on the Isobox is set to the correct voltage before connection.

If an Isobox isolation transformer is not available for connecting a mains powered accessory, the system may NOT be used.

Creating Curve I/O Settings

Before the curve inputs and outputs can be used, new settings or protocol files need to be created. There are no sample factory defaults since most likely users will want to create their own unique configuration files.

Use the following steps to create configuration files with curve inputs and/or curve outputs:

1. In the acquire mode, load the protocol or settings file which you want to use or create a new settings or protocol file and set the system up the way you want it.

2. Select the **External Connections** menu point out of the Configuration menu (Figure 1).

3. Click on the analog outputs tab to configure the output channels for the correct curve (Figure 2) or click on the analog inputs tab to configure the input channels for an analog curve (Figure 3). Refer to the explanation on the next page.

Note: The external connections dialog box is only available in the acquire mode and only before any data has been saved.

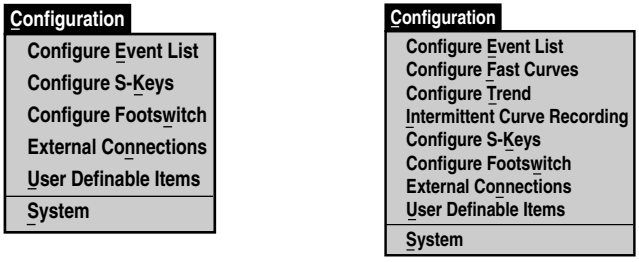

Figure 1: Click on the Configuration menu and then on the External Connections menu point (diagnostic and monitoring examples).

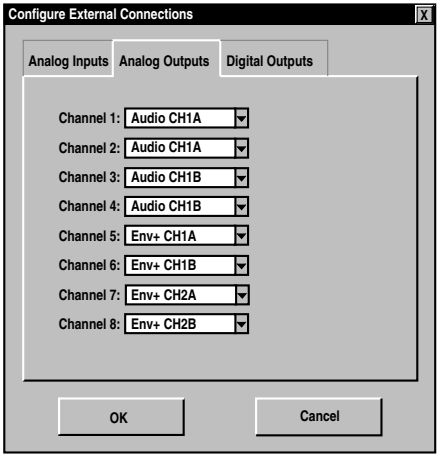

Figure 2: External Connections dialog box (analog output tab).

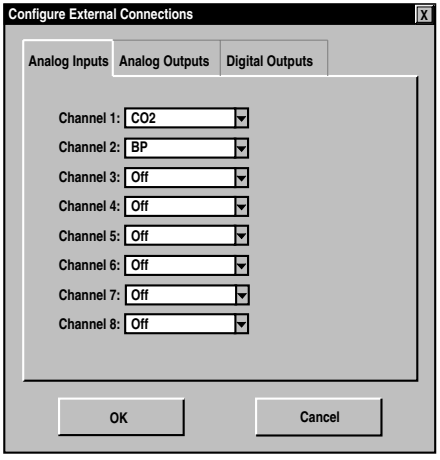

Figure 3: External Connections dialog box (analog input tab).

Creating Curve I/O Settings (continued)

4. There are eight available inputs and eight available outputs which correspond with the RCA connectors on the analog connection box. Activate the desired signal(s) for the inputs or outputs by clicking the mouse on the combo box selection arrow (to the right of the white boxes) for the appropriate numbered connector and choosing the signal from the list of available signals (Figures 1 and 2).

5. When all signals have been configured as desired, click on **OK** to activate the external connections.

6. Once the required external connections have been assigned and loaded, the settings should be saved by saving the active setting or protocol file with the **Save** or **Save As** functions in either the Settings or Protocol menus.

Note: The choices available for each combo box list are dependent on the configuration of the user definable items as well as on the present system setting (number of channels, etc.). Figure 1 shows an example list with two user defined analog inputs. Figure 2 shows an example list of analog outputs for a 1x4 MD channel setting.

Note: If audio inputs or outputs are also assigned, then the total number of available channels is reduced.

Note: In order to create the list of user defined analog inputs, refer to the next section *Defining Analog Curve Input Signals*.

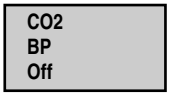

Figure 1: User defined analog curve inputs.

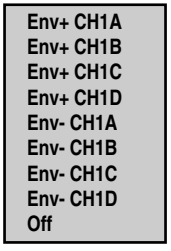

Figure 2: Available analog curve output signals (1x4 MD Monitoring).

Defining Analog Curve Input Signals

In order to create the list of available signals for the analog inputs, the following steps should be used:

1. Select the **User Definable Items** menu point out of the Configuration menu (Figure 1).

2. Click on the analog curve inputs tab (Figure 2).

3. Click on the **Add** button to add a new analog curve name to the bottom of the list. The Analog Curve Inputs dialog (Figure 3) will pop up allowing a new curve name, units, minimum scale, and maximum scale to be entered. Type in a new name, select the units, type in the scale limits, and then press OK.

4. In order to insert a curve name, click on a line in the list and then select the **Insert** function to insert a new curve name below the selected line.

5. In order to edit a curve name, click on the line in the list and then select the **Edit** function.

6. In order to delete a curve name, click on the line in the list and then select the **Remove** function.

7. In order to move a curve name up or down, click on the line in the list and then select either **Move Up** or **Move Down**.

8. When the list(s) is finished, press OK to save the changes.

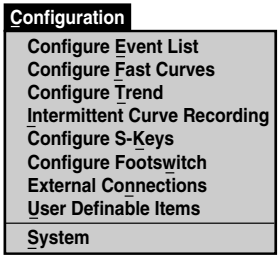

Figure 1: Click on Configuration and then on User Definable Items.

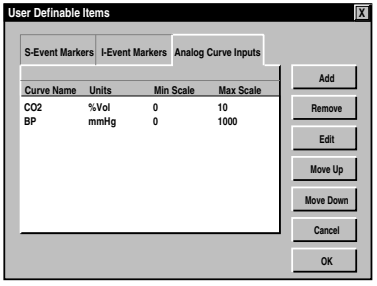

Figure 2: User Definable Items dialog box (analog curve input tab).

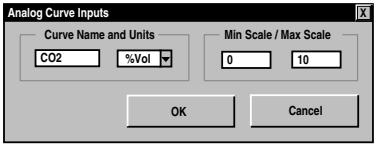

Figure 3: Analog Curve Inputs.

Toggling the Fast Curves Window

In order to configure and calibrate the analog curve inputs, the Fast Curves window must be displayed in the acquire mode.

In order to activate the fast curves window in the acquire mode, the following methods can be used:

Method 1

1. Click on the **View** menu (Figure 1).

2. Click on **Fast Curve Window**. When this function is selected, it will be checked in the menu, and the Fast Curves window should be shown. When this function is not selected, it will not be checked in the menu, and the Fast Curves window should not be shown.

Method 2

1. Configure an S-key with the function **Fast Curve Window**.

2 Click on **Fast Curve Window**.

Note: The display of the Fast Curve window in the monitoring acquire and review modes is configurable so users, who do not wish to see it, can toggle it off and get more space for their other windows. When the window is not shown, the splitter bar between the two curve windows is not displayed anymore.

Note: When the Fast Curve window is not shown in the monitoring acquire, the data saving should continue to run in the background. When the Fast Curve window is turned back on in the monitoring acquire mode, the spectral displays should clear out and all the displays should appear again and start sweeping from the left side of the display. This will ensure that the displays are synchronized.

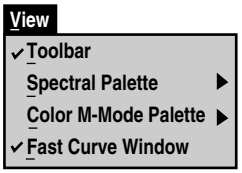

Figure 1: View Menu.

Configuring the Display for External Curve Inputs

After the curve inputs have been selected, they still need to be configured for display in the trend and fast curve windows. One of the following procedures should be used:

Method 1

1. Click on **Configuration** (Figure 1).
2. Click on **Configure Trend** or on **Configure Fast Curves**.
3. Click on **Curve Configuration**.
4. Go to the next page.

Method 2

1. Position the mouse pointer (it will change to a crosshair) inside the Trend or Fast Curve window (Figure 2) and then click the **Right** mouse button.
2 Click on **Curve Configuration** (Figure 3).
3. Go to the next page.

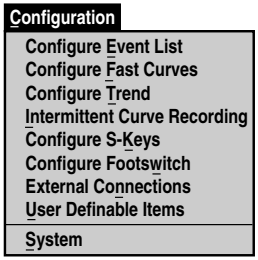

Figure 1: Click on Configuration.

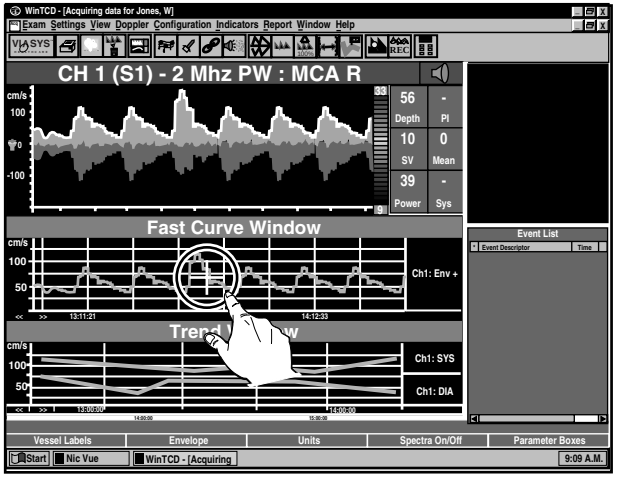

Figure 2: Right click inside the Fast Curves window.

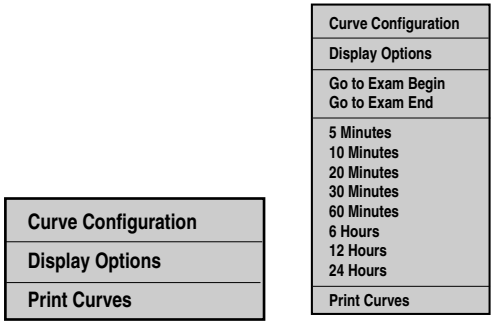

Figure 3: Click on Curve Configuration.

Note: Refer to section S8 in this handbook for more information on how to review the fast curve and trend data. In section S8, the other curve configuration possibilities are explained.

Choose the external inputs to be displayed

1. Click on the **External Inputs** Configuration tab (Figure 1).

2. Choose the curve (s) you want displayed by clicking on (checkmark) its associated **check box** (Figure 1).

3. Select the curve colors by clicking the mouse on the arrow and choosing them out of the list (Figure 1).

4. Choose the curve scale limits by setting the **Minimum** and **Maximum** Y-scale ranges (Figure 1).

5. Calibrate the curves, if necessary, using the procedure on this page.

6. When finished making your selections, click on **OK.**

! CAUTION

Always ensure that the analog curve input signals have been properly calibrated before saving examination data. Do not ignore the warning messages whioh occur when proper calibration values do not exist for the curves.

Calibrate the external inputs

1. Click on the **Calibrate** button (Figure 1) for the curve input to be calibrated.

2. A pop up dialog box, as shown in Figure 2, appears. Set the external device to output a known value (usually the minimum scale value) and then select the corresponding true scale value in the lower scale section of the dialog box. Click on the **Assign Lower Value** button to set the value.

3. Set the external device to output a known value (usually the maximum scale value) and then select the corresponding true scale value in the upper scale section of the dialog box. Click on the **Assign Upper Value** button to set the value.

4. Confirm this dialog by clicking on the OK button. The software will automatically calibrate the input by calculating the gain and offset needed so the analog input matches the scale appropriately.

Note: The calibration values are stored in the settings file, if the setting is saved, so the calibration procedure is usually only needed the first time the external device is used.

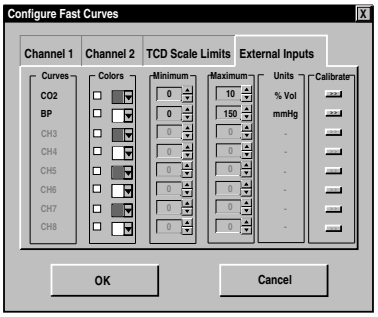

Figure 1: Click on (checkmark) each of the external inputs you want displayed and then click on OK.

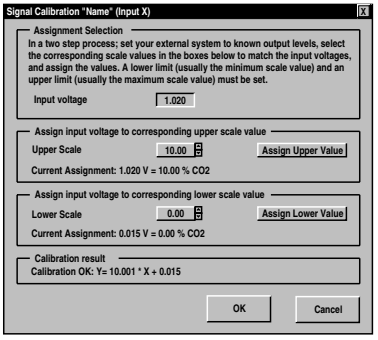
Signal Calibration "Name" (Input X)
Assignment Selection
In a two step process; set your external system to known output levels, select the corresponding scale values in the boxes below to match the input voltages, and assign the values. A lower limit (usually the minimum scale value) and an upper limit (usually the maximum scale value) must be set.
Input voltage
1.020
Assign input voltage to corresponding upper scale value
Upper Scale
10.00
Assign Upper Value
Current Assignment: 1.020 V = 10.00 % CO2
Assign input voltage to corresponding lower scale value
Lower Scale
0.00
Assign Lower Value
Current Assignment: 0.015 V = 0.00 % CO2
Calibration result
Calibration OK: Y= 10.001 * X + 0.015
OK
Cancel

Figure 2: Signal Calibration dialog for curve inputs.

! CAUTION

When different models of external devices are used for a certain type of signal, the calibration often needs to be done for each device. Create different settings for each type of external device and properly save tha calibration in the setting. At the beginning of each examination, select the appropriate setting which corresponds with the device.

External Curve Output Calibration

The external analog curve outputs are calibrated in a fixed way: Every 100 cm/sec = 1 V on the output signal. An envelope point at 50 cm/sec would therefore produce an output voltage of 0.5V. If the flow is toward the probe, the voltage is positive. If the flow is away from the probe, the voltage is negative.

When the system has curve signals assigned to analog outputs, the signals are sent from the analog in/out board to the assigned channels on the analog connection box at the sample rate of the spectral columns. The faster the spectral sweep speed, the higher the sample rate on the outputs.

Sample Rates (Analog Outputs)

The sample rate for the external analog curve outputs is dependent on the spectral sweep speed. This can be adjusted using the Sweep key on the remote control.

The sample rate can be calculated by taking the number of full seconds in the sweep time and dividing this number by 500 to get the column rate in ms. Then divide 1 by the column rate to get the sample rate.

The highest sample rate is obtained when the 2s sweep time is used. This corresponds with a 4 ms column rate resulting in a sample rate of 250Hz.

The lowest sample rate is obtained when the 40s sweep time is used. This corresponds with a 80 ms column rate resulting in a sample rate of 12.5Hz.

Sample Rates (Analog Inputs)

The sample rate for the external analog curve inputs is dependent on the number of analog input channels. The highest rate is obtained when one input channel is used. The lowest rate occurs when eight analog input channels are used. Refer to the list below for the sample rates.

1 Channel : 98Hz
2 Channels : 61Hz
3 Channels : 54Hz
4 Channels : 49Hz
5 Channels : 40Hz
6 Channels : 34Hz
7 Channels : 37Hz
8 Channels : 33Hz

Creating Continuous SoundTrak Settings Files

In order to record Continuous SoundTrak data, special acquire mode settings need to be created. There are no sample factory default settings since most likely users will want to convert their own customized settings to record the Continuous SoundTrak data.

Use the following steps to create Continuous SoundTrak settings:

1. In the acquire mode, load the settings file which you want to use or create a new settings file and set the system up the way you want it.

2. Select the **External Connections** menu point out of the Configuration menu(Figure 1).

3. Click on the **Digital Outputs** tab to access the Continuous SoundTrak configuration facility (Figure 2).

4. Configure the Continuous SoundTrak Recording combo box to On by clicking the mouse on the arrow and selecting On (Figure 2).

5. When finished, click on **OK.**

6. Save the active setting with the **Save** or **Save As** functions in the Settings menu.

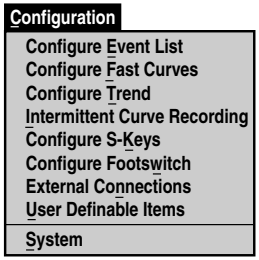

Figure 1: Click on the Monitoring Configuration menu and then on the External Connections menu point .

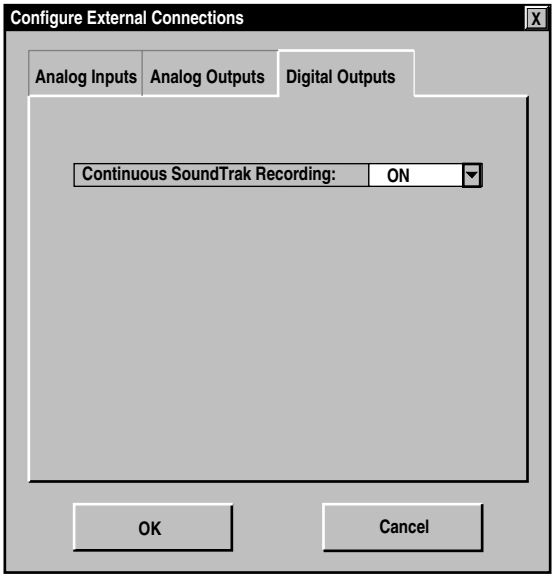

Figure 2: External Connections dialog box (digital output tab).

Note: The external connections dialog box is only available in the acquire mode and only before any data has been saved.

Note: Continuous SoundTrak is only available in the monitoring mode and only if there is a valid software license installed on the system which contains the option.

Note: Continuous SoundTrak settings will be colored blue in the list of settings in the settings manager. They will also have a blue dot next to the name.

Creating Files Containing Continuous SoundTrak Data

When a Continuous SoundTrak setting is loaded, everything continues to function in a very similar way to the normal operating mode. However, once the curve data saving is turned on, the system will start to record Continuous SoundTrak data in parallel with the curve data to the disk for all the channels which are active.

While Continuous SoundTrak data is being recording, a blue dot appears next to the speaker symbols (Figure 1) in a similar way to the red dot which is used in the external audio record mode.

The Continuous SoundTrak saving stops when the curve saving is deactivated or when the user exits the acquire mode. The blue dot is removed from the spectral displays and replaced with a pause symbol when the curve saving is deactivated. In this way, it is possible to do intermittent type monitoring during the exam and create a type of segmented saving to reduce disk space requirements.

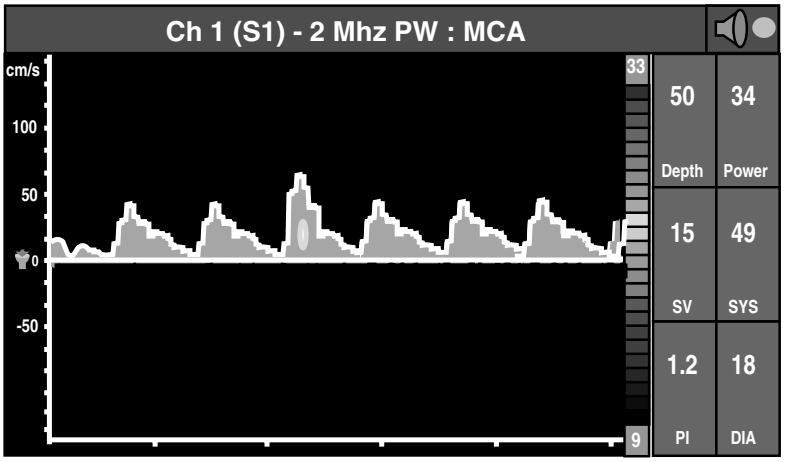

Figure 1: Spectral Display with Continuous SoundTrak Record Indicator (Blue Dot).

Note: The Continuous SoundTrak data is only recorded when the curve recording is active. This creates a 1:1 recording of curve data and the associated Continuous SoundTrak data to ensure proper operation in the review mode. See Chapter S8 in this handbook.

Note: Each time the Continuous SoundTrak recording is started, the system makes an estimate of the amount of recording time available in hours by checking the free drive space and making a calculation based on the present system configuration. If the amount of recording time available in hours is less than 10, then the amount is displayed in the message window and removed after a few seconds.

Note: As a result of the large amount of space, which is required to store the Continuous SoundTrak data, the message showing the amount of recording time available automatically appears when the time available is under 1 hour. In this case, the message is drawn in red text and it appears every minute.

Note: The amount of recording time available and the data rate requirements for the active setting can be found in the Exam Info menu point.

Keeping Track of File Size

In many cases, especially when the continuous SoundTrak feature is used, the WinTCD examination file sizes can get quite large. In these cases, users may want to track their file sizes so they can stop the examination before the examination size exceeds the backup media size.

In order to keep track of the file size, an additional file size indicator has been added to the right side of the trend display title bar (Figure 1). This text indicator is in the format “File Size: XXXMB / XX%”.

The MB number is the total file size in MB and the % number is the file size as a percentage of the configured maximum file size (See section S14). If the file size goes over 1GB, then the numbers are readjusted and the letters GB are used.

The file size indicator is updated every minute if no snapshot saves or snapshot deletes have been made since the last update. If a snapshot save is made, the update is rescheduled to occur after the save. If a snapshot is deleted, the update occurs immediately.

Note: If the free harddisk space runs out during an examination, the system automatically stops data saving at the limit and displays a dialog as shown in Figure 2. The dialog box says “Harddisk is full! Storage has been stopped and all data saving abilities have been disabled. Please archive or delete data prior to creating next examination.”. The user is forced to choose **OK**. This dialog is proceeded by numerous warning messages.

Harddisk is Full
X
Harddisk is full! Storage has been stopped and all data saving abilities have been disabled. Please archive or delete data prior to creating next examination.
OK

Figure 2: Full Harddisk Dialog.

Reconfiguring the Maximum File Size

If the maximum file size limit is reconfigured during an examination (See section S14), the file size indicator gets its % value readjusted. The new maximum limit is used for the messages.

If the examination size already exceeds the new limit, the system continues to run and save data but the % indicator shows a value over 100%.

In the case that the maximum file size was already reached and the system automatically turned data saving off but the new limit now allows more data saving, then the the user can manually reactivate data saving.

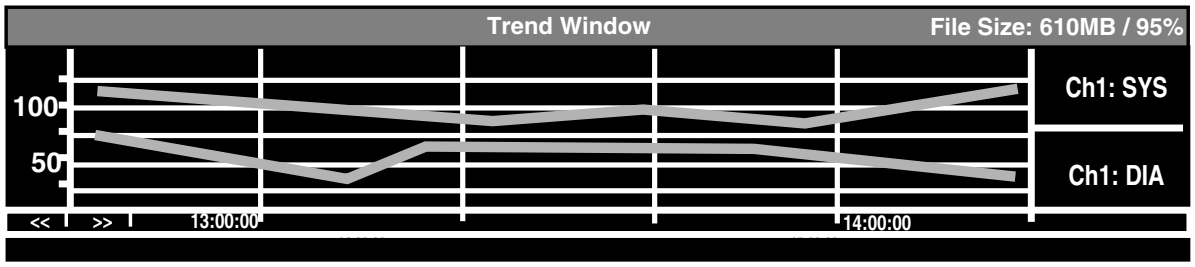

Figure 1: Trend Display with Current File Size Indicator.

Reaching the Maximum File Size

If during an examination, the file size goes above 90% of the configured maximum file size, a warning message in the color red, appears in the message window. The message says “File Size (XXXMB) at 9X% of maximum defined limit”. The message with new % number repeats each time more data is saved if a least another 1% has been used.

In the monitoring acquire mode, shortly after the first red warning message (90%) disappears from the message window, a pop up warning dialog appears as shown in Figure 1. The dialog box says “File size will soon exceed the maximum defined limit for the selected backup media. Data saving will be halted unless you choose to override.”. The user is given the choice of **Override** or **Stop**.

If the user answers **Stop** to the dialog box, the system continues to run and save until the maximum file size limit is reached. Once this happens, the ability to store data is halted. Continuous SoundTrak recording and curve saving are automatically turned off. The ability to save spectral records is turned off.

Once the maximum file size has been reached, another pop up dialog appears as shown in Figure 2. The message says “File size has reached maximum defined limit for the selected backup media. Storage has been stopped and all data saving abilities have been disabled.”. The user is forced to choose **OK**.

If the user answers **Override** to the first dialog box, then immediately a second dialog box appears as shown in Figure 3. The dialog box says “Overriding will create a file size that will exceed limits of selected backup media! Are you sure?”. The user is given the choice of **Yes** or **No**.

If the user answers **No** to the dialog box, then the system reacts in the same way as **Stop** was handled.

If the user answers **Yes** to the dialog box, then the system does not stop data saving when the maximum defined limit is reached. The red warning messages for the maximum file size no longer appear. The real time file size indicator is allowed to go over 100% and the MB/GB number continues to increment.

If the user doesn’t answer the original Override dialog or they do not confirm the Override in time, the system stops data saving at the limit and changes the dialog to that in Figure 2.

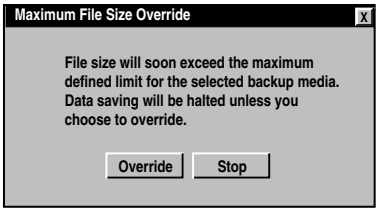
Maximum File Size Override
X
File size will soon exceed the maximum defined limit for the selected backup media. Data saving will be halted unless you choose to override.
Override
Stop

Figure 1: Maximum File Size Override Dialog.

File Size at Limit
X
File size has reached maximum defined limit for the selected backup media. Storage has been stopped and all data saving abilities have been disabled.
OK

Figure 2: File Size at Limit Dialog.

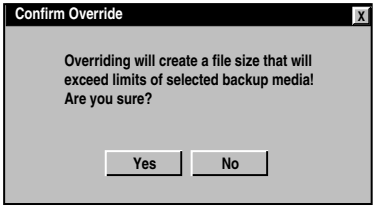
Confirm Override
X
Overriding will create a file size that will exceed limits of selected backup media! Are you sure?
Yes
No

Figure 3: Confirm Override Dialog.

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